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**CDRL 24**

**LABORATORY QUALITY CONTROL PLAN  
(LQCP)**

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*(Original signatures on file)*

# CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)

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### NOTE

This document is used by several other entities in addition to this Permit. Any category in *italics/bold* has not been approved by the Executive Secretary for use at TOCDF. A written request must be submitted and approval granted from the Executive Secretary prior to implementation.<sup>C1</sup>

### 1. **PURPOSE**

The purpose of this document is to provide direction for all Quality Control (QC) activities related to the monitoring and analytical functions performed at TOCDF.

The U.S. Army Chemical Materials Agency (CMA) developed the Laboratory and Monitoring Quality Assurance Plan (LMQAP) and the Monitoring Concept Plan (MCP) to define the minimum<sup>C1</sup> requirements for laboratories and monitoring teams to implement a quality system to support CMA activities. This Laboratory Quality Control Plan (LQCP) describes the quality control program to be implemented by the Tooele Chemical Agent Disposal Facility (TOCDF) Laboratory Department.

Public Law (PL) 99-145 requires CMA to carry out the destruction of the nation's stockpile of unitary chemical agents and munitions. PL 102-484 requires CMA to identify the locations, types, and quantities of the nation's non-stockpile chemical materiel (NSCM). CMA will accomplish these congressional mandates by implementing comprehensive programmatic guidance, including quality assurance (QA) requirements for all phases of treatment, storage, transportation, and demilitarization activities.

### 2. **SCOPE**

The requirements of this LQCP are applicable to all TOCDF and subcontractor personnel performing agent and non-agent monitoring, analyses, and related quality control activities at TOCDF.

The scope of this LQCP covers surety materiel, non-surety materiel, quantitative and qualitative laboratory analytical methods, and near real-time (NRT) monitors that are used to analyze solid, liquid, and air samples at the TOCDF. This document outlines the purpose, policy, organization, and operations of all quality assurance/quality control (QA/QC) programs that have been established to support the TOCDF laboratory. The emphasis of this LQCP is to ensure that all activities generate credible scientific data. This includes those aspects of field sampling that may affect the integrity of samples, as well as laboratory activities.

#### 2.1. **Waivers and Deviations**

After approval of this LQCP, requests for additional waivers or deviations from the requirements of the LMQAP or MCP will be submitted in writing to the TOCDF Field Office for submission to CMA and the Executive Secretary<sup>C1</sup> for approval prior to implementation. The request for waiver will

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identify the actions taken to implement the requirement, justification for why the requirement cannot be implemented, and impact on operations. If the LMQAP or MCP is different from of conflicts with other codes or regulations from state and/or federal authorities, the TOCDF Field Office will be notified for resolution and the most stringent requirement will be followed, pending resolution. Any waivers or deviations issued under Section I of Program Manager for Chemical Demilitarization (PMCD) Policy Statement No. 49, for Research Development, Test, and Evaluation (RDT&E) dilute operations will meet the intent of this requirement. Approved waivers that conflict with a requirement of this LQCP will supersede the requirement in this document until this document can be revised to incorporate the guidance given in the waiver.

Requests for waivers or deviations from requirements listed in this document that do not conflict with the requirements of the LMQAP or MCP will be submitted in writing to the TOCDF Laboratory Quality Control Manager. Once the waiver is approved, the guidance may be followed until such a time that the LQCP can be updated to reflect the new guidance.

### 2.2. Laboratory and Monitoring Systems

Information obtained from monitoring will be used to ensure that TOCDF operations are being conducted properly and to detect any conditions that may cause a release of chemical materiel or personnel exposure.

Monitoring must be performed using instruments selected to measure the proper parameters for the specific chemical encountered at its associated monitoring level. Samples must be taken at intervals designed to ensure that useful information will be available within acceptable time limits. The instruments and methods used must be sufficiently sensitive to reliably measure threshold quantities at required levels. To accomplish these goals, instruments and methods used by TOCDF will include those specifically developed by the Army to monitor chemical materiel under specific conditions in air, liquid, soils, and solids. Other methods may be used if they are more sensitive, specific, or faster and meet the requirements of the existing methods for precision, accuracy, and reliability, as described in this LQCP.

An overriding requirement of the design and development of monitoring systems is reliable day-to-day performance. Reliability, in this context, relates to the ability of the instrument or method to perform its intended function when called upon to do so. Selection of monitoring and sampling locations is also critical to an effective monitoring program. The monitors must be positioned so that samples may be collected from representative points where any released chemical or other chemical hazard would likely be detected. Locations for ambient air monitors must be selected to provide optimum information and maximum protection for workers and the environment. Wastes must also be sampled to provide information

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representative of the matrix. Location requirements for monitoring systems are provided in the TOCDF Monitoring Concept Plan (Appendix A).

### **2.3. Program Updates**

This LQCP will be updated whenever: (1) the CMA programmatic LMQAP or MCP is revised or updated; (2) new regulatory guidance is promulgated; (3) new site-specific QC requirements are implemented. Changes to the LQCP will be submitted to the TOCDF Field Office for transmission to CMA for approval.

## **3. REFERENCES**

See Appendix B for References

## **4. ACRONYMS/DEFINITIONS**

See Appendix C for Definitions and Appendix D for Acronyms

## **5. RESPONSIBILITIES**

### **5.1. CMA-Risk Management Directorate (CMA-RMD)**

CMA-RMD is responsible for overseeing all CMA project activities and for the effective implementation of a comprehensive system of QA, monitoring, safety, and environmental activities.

### **5.2. CMA-Monitoring Office**

CMA-Monitoring Office defines laboratory and monitoring QA requirements for all chemical materiel-monitoring activities. CMA-Monitoring Office will review the quality of the CMA laboratory and monitoring data such that it is representative, technically correct, and valid. CMA-Monitoring Office or representative will conduct audits and surveillances of laboratory and monitoring activities, either announced or unannounced. All documents and data produced by the TOCDF laboratory or monitoring teams will be eligible for inspection. CMA Monitoring Office will monitor and oversee the effective implementation for the CMA Programmatic LMQAP.

### **5.3. CMA Laboratories**

CMA laboratories include all laboratories supporting CMA laboratory and monitoring operations with support from analytical and monitoring personnel to include short-term and long-term operations using surety and non-surety materiel.

### **5.4. Quality System Requirements**

The TOCDF Laboratory's primary Quality Control guidance document is this LQCP. The primary responsibility of Laboratory QC personnel is to

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ensure this document provides laboratory personnel the guidance required to meet or exceed the intent of the requirements of the LMQAP and the MCP. Laboratory Quality Control is also responsible to ensure that Laboratory Operating Procedures (LOPs) comply with the requirements of this LQCP.

### 5.4.1. Quality Policy Statement

The ultimate success of the TOCDF Laboratory is to ensure customer satisfaction by providing a Quality Management System (QMS) which monitors laboratory performance to ensure compliance with Federal, State and local regulations. The laboratory commits to provide customer satisfaction through ensuring the following objectives are met:

- Ownership of work, including accountability, integrity and ethics
- Verbatim compliance to operating procedures
- Generation of legally defensible data
- Effective communication
- Ongoing training
- Continuous Improvement

### 5.4.2. Organization Description

TOCDF is managed by the CMA. CMA has assigned a Site Project Manager to oversee the overall operation of TOCDF. CMA has also designated a Site Laboratory Project Manager to oversee the operation of the laboratory. CMA has contracted with EG&G Defense Materials Inc. (EG&G), to operate TOCDF. EG&G has contracted with Battelle to perform the laboratory functions for TOCDF.

- The TOCDF Laboratory Department is divided into three separate organizations, Analytical, Monitoring, and Quality Control. The Analytical Manager and Monitoring Manager each report directly to the Laboratory Manager. The QC Manager reports to the EG&G Quality Manager operationally, and to a Vice President of Battelle administratively. Detailed descriptions of the organizational relationships and organization charts are maintained and published by EG&G. Current copies will be maintained on file in the laboratory.
- Detailed job descriptions are maintained on file in the TOCDF Laboratory.
- Personnel records that include skills and experience of laboratory personnel are maintained on file in the laboratory.

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Training records are maintained on file by the TOCDF Training Manager.

- Current job descriptions are maintained on file in the laboratory.
- Agent Custodians are identified by the Laboratory Manager and an updated list is maintained on file in the laboratory.
- Approval signatories for TOCDF Laboratory Operating Procedures (LOPs) are listed in PRP-DC-001, *Procedure or Plan Revision, Change, or Deletion*
- A master list of all LOPs is maintained by TOCDF Document Control. TOCDF Document Control has responsibility for overseeing all controlled documents.
- TOCDF Laboratory Technical Managers are the Laboratory Manager, Laboratory Analytical Manager, Laboratory Monitoring Manager, and the Laboratory Quality Manager. During events of planned absences each Manager will designate, in writing, an acting deputy. In the event of an unplanned absence the Deputy will be as follows:

**Table 5-1. Laboratory Technical Managers and Assigned Deputies**

Absent <sup>C1</sup> Manager	Assigned <sup>C1</sup> Acting Deputy
TOCDF Laboratory Manager	Laboratory Monitoring Manager
Laboratory Analytical Manager	Special Sample Supervisor
Laboratory Monitoring Manager	Monitoring Operations Supervisor
Laboratory Quality Control Manager	Laboratory Quality Specialist

### 5.4.3. Management Review

At a minimum of once every 12 months the TOCDF Laboratory Management Team will perform a review of the Laboratory Quality system. This team will include as a minimum the Laboratory Manager, the Analytical Manager, the Monitoring Manager and the Laboratory Quality Manager. The Management Review will include but not be limited to the following items:

- Review and evaluate the records of internal and external audits and of follow-up actions from previous management reviews.
- Review status of preventive and corrective actions, customer suggestions, comments, concerns, complaints, and customer satisfaction.

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- Consider external influences such as new technology, changing or new regulations, organizational changes, etc., that could affect product, service, and/or the quality system.
- Review and assess the entire quality system, including a determination of its suitability, adequacy, effectiveness, and process performance.
- Review subcontractor audits to ensure corrective actions have been taken and are adequate (if applicable).
- Generate recommendations and courses of action, including resource needs and actions for improvements to the quality system, processes, and products.
- Initiate actions, including periodic follow-up reviews to verify implementation and evaluate status of each action until all action items have been completed and documented.
- Evaluate the need for changes to the organization's quality system policy and objectives, review of quality objectives, and whether objectives are being met.
- This annual review will follow the procedures outlined in GDL-LA-001, Conducting Laboratory Management Reviews.

### 5.5. Quality System

#### 5.5.1. Laboratory Quality Control Plan (LQCP)

The requirements in this LQCP will either meet or exceed the intent of the requirements of the LMQAP and the MCP. Both agent and non-agent monitoring and analytical QC activities that occur at TOCDF are regulated by this plan. This LQCP becomes the official quality operating guide for the TOCDF Laboratory Department once it has been signed by a member of CMA and approved by the Executive Secretary<sup>C1</sup> for TOCDF laboratory operations the programmatic LMQAP and MCP are considered minimum<sup>C1</sup> advisory guides only.

#### 5.5.2. Quality Planning

Changes or additions to the current TOCDF Laboratory scope of work will be evaluated by laboratory management to ensure the following:

- New activity will be in accordance with the TOCDF Laboratory Quality Policy Statement;
- Purpose of the quality system and how it pertains to the new activity;

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- Personnel certification process to include understanding and training on the quality system, implementing policies, and performing procedures associated with the new activity;
- Laboratory management commitment to good professional practice and quality of data generated by the new activity;
- Laboratory management commitment to compliance with LMQAP, Federal, State, and local regulations and permit conditions as they pertain to the new activity;
- Defining the roles and responsibilities of technical and quality managers as it pertains to the new activity;
- Develop specific quality objectives for the new activity that are measurable, quantifiable, and consistent with the TOCDF Laboratory Quality Policy.

### 5.6. Other Quality Documentation

A master list of all sub-tier documents to include Laboratory Operating Procedures (LOPs), Project Regulatory Procedures (PRP's), Work Packages, and internally developed computer programs will be maintained on file in the Laboratory.

#### 5.6.1. Laboratory Operating Procedures (LOPs)

All routine monitoring and analytical activities performed by the TOCDF Laboratory are in accordance with approved LOPs. Changes to LOPs will be processed in accordance with PRP-DC-001, Procedure or Plan Revision, Change or Deletion. LOPs must provide specific and technical details on monitoring and/or analytical tasks. These procedures may include QC activities that must be performed and provide specific and technical guidance to laboratory personnel. PRP-DC-001 lists the approved signatories for initial LOP approval as well as the signatories required to approve changes to an LOP.

#### 5.6.2. Work Packages

Occasionally, the laboratory will receive requests to perform monitoring or analytical functions or perform special tests that are not covered by existing procedures. In these instances a Work Package will be generated. The protocol will include as a minimum, a unique study name, the objective, proposed procedure, QC requirements, and safety requirements. Specific requirements are outlined in PRP-MG-015, Planning, Scheduling, Implementation and Documentation of Work Activities. All reports using data generated from a work package will reference the work package and will provide results and conclusions. All work packages will be approved by the immediate supervisor, the respective Manager, the Laboratory QC Manager, and the Laboratory Manager. Any of the

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approving signatories may request other TOCDF officials (e.g., Deputy Project Manager, Safety Manager, Surety Manager, etc.) to review and approve the work package. A work package may only be used when procedures do not exist. They may not be used in an effort to deviate from approved LOPs. Once completed, the work package will be converted to a formal Laboratory Operating Procedure if it is to become a routine activity.

### 5.6.3. Internally-Developed Computer Programs

Internally-developed computer programs are developed, maintained and documented by Laboratory Programmer or designee in accordance with CDRL 11, Laboratory Operating Plan.

### 5.7. Regulatory Agencies

TOCDF is regulated by a number of agencies. The primary regulatory agencies that oversee laboratory operations are the State of Utah Division of Solid and Hazardous Waste (DSHW) and the Federal Center for Disease Control. These and other regulatory agencies can impose quality control requirements above the requirements of the programmatic<sup>C1</sup> LMQAP and MCP. Requirements imposed by regulatory agencies that conflict with the guidance given by CMA will be incorporated into this LQCP as directed by CMA. Concerns or problems with laboratory performance, plans or procedures will be routed from the regulatory agency through CMA and directed actions will be provided to the laboratory in accordance with PRP-MG-002, Control of PMCD Directed Actions.

## 6. IMPROVEMENT

### 6.1. General

TOCDF Laboratory Management continually seek improvements to the effectiveness and efficiency of the laboratory and monitoring processes through the use of customer feedback, management reviews, corrective actions and preventive actions rather than wait for problems to arise.

#### 6.1.1. Continual Improvement

The TOCDF Laboratory continually evaluates the effectiveness of the quality system through the evaluation of the quality policy, quality objectives, internal and external audit results, surveillance results, review of data, review of corrective actions, review of preventive actions, and management review.

#### 6.1.2. Customer Satisfaction

Quarterly, the TOCDF Laboratory Manager, Analytical Manager, Monitoring Manager, and Quality Control Manager will meet with EG&G Senior Management and Government Field Office representatives to obtain feed back on customer satisfaction. A written report will be prepared by laboratory management detailing

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the results of this meeting. This report will be submitted to EG&G Management and the TOCDF Field Office for concurrence and maintained on file in the laboratory.

### 6.2. Corrective Action

It is the responsibility of every laboratory employee to implement corrective actions when nonconforming work or departures from approved policies or procedures are identified. All corrective actions will be documented. Additionally, corrective actions will be tracked and monitored by laboratory management to evaluate the implementation and effectiveness of corrective actions.

#### 6.2.1. Immediate Corrective Actions

Immediate corrective action is required when a monitoring system or quality control sample is out of control. Individual LOPs specify when to take corrective actions and what corrective actions are appropriate for individual situations. After all immediate corrective actions, the effectiveness of the corrective action must be verified by generating a passing monitoring level QP challenge or a passing continuing calibration verification sample (CCV). All immediate corrective actions will be documented. Weekly, immediate corrective actions will be evaluated by laboratory management to verify if the implementation and effectiveness of the immediate corrective actions are appropriate.

For a confirmed filter stack alarm, the DAAMS monitoring the most downstream midbeds will be pulled and analyzed for the confirmed agent. The DAAMS tubes shall be pulled and analyzed in accordance with Attachment 3, Sampling, Analytical, and QA/QC Procedures)<sup>C1</sup>

#### 6.2.2. Long-Term Corrective Actions

Long-term corrective action is required when systemic problems or non-conformances are identified. TOCDF has several methods to identify, document and implement long-term corrective actions. These include the TOCDF critique process (PRP-MG-012), the development of a formal investigation team (PRP-MG-014) and the use of deficiency reports and deficiency log items (PRP-QA-014). Long-term corrective actions will be developed by Laboratory Management and approved by the organization identifying the problem. The implementation of the corrective action will be verified by the organization approving the corrective action. Quarterly, long-term corrective actions will be evaluated by laboratory management to verify if the implementation and effectiveness of the long-term corrective actions are appropriate. Long-term corrective action is tracked by TOCDF Quality

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Management and documented in accordance with applicable procedure.

### 6.2.3. Root Cause

Root Cause is defined by CMA as: "The most basic cause that can be reasonably identified and that management has control to fix." Root cause determination will be documented, tracked, and verified in accordance with one of the three procedures used to identify the need for long-term corrective actions.

### 6.3. Preventive Action

Preventive action is directed toward eliminating the causes of potential non-conformities. GDL-LA-001 defines the procedures for performing preventive action. The following items will be addressed by GDL-LA-001:

- Determining potential nonconformities and their causes
- Evaluating the need for action to prevent occurrence of nonconformities
- Determining and implementing action needed
- Recording results of action taken
- Reviewing preventive action taken.

### 6.4. Preventive Maintenance

Preventive maintenance will be scheduled for all monitoring and analytical equipment. Manufacturer's recommendations will be used as guidance when developing the preventive maintenance schedule. All preventive maintenance will be documented. Tracking and trending of all maintenance activities will be performed. Trends observed that may adversely affect the performance of laboratory or monitoring equipment will require changes in the preventive maintenance schedule. Additionally, a spare parts list will be maintained for all laboratory and monitoring equipment.

### 6.5. <sup>C1</sup>Nonconformances

Nonconformances are documented and tracked in accordance with PRP-QA-014, Control of Nonconformances.

## 7. PERSONNEL

Laboratory management will ensure the competence of all personnel who operate, maintain, service, perform tests and/or calibrations, evaluate results and sign reports on laboratory equipment through an extensive training program and operator certification and recertification process. Job descriptions including description of duties are maintained on file by laboratory management. It is laboratory management's responsibility to ensure that Individuals assigned job duties have requisite experience and training to perform the assigned position. All

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required training is maintained by the TOCDF training department and outlined in the TOCDF Personnel Training Plan. TOCDF Training is responsible for maintaining all training documentation. Specialized on the job training (OJT) is performed by personnel after completion of all required training courses. This OJT covers local equipment, plans and procedures. Additionally this OJT is performed under the direct supervision of a person who is currently certified on the system/equipment being used. Operator certification and recertification protocol are developed by the applicable manager and approved by the Laboratory Manager and the Quality Control Manager. All operator certifications are documented and submitted for approval to the applicable Manager, Laboratory Manager, and the Quality Control Manager and maintained on file by the applicable manager.

### **7.1. Operator Certification**

Once an individual has completed their training path they will start a job performance certification process. An individual will be considered a certified operator when the EG&G training path has been completed and all of the items listed in the Job Performance Measure<sup>C1</sup> (JPM) certification cards are complete and have been signed off. Additionally, some job positions require board certification prior to the operator being certified. Operators may be certified to perform specific functions un-supervised prior to fully completing the JPM card by completing internal laboratory certification requirements for a specific function. For instance, a GC Operator may be certified to analyze DAAMS samples without supervision if he/she has: 1) Completed all required training; 2) Completed the internal laboratory operator certification; and 3) Completed the applicable items in the JPM certification even though all items in the JPM certification card have not been completed. Internal laboratory operator certification requirements are found in TE-LOP-553.

### **7.2. Operator Re-certification**

Quarterly, personnel who operate DAAMS GC-FPD, DAAMS GC-MSD/FPD, GC-FID, GC-FPD, GC-MSD, NRT Monitors, and CEMS will be required to demonstrate proficiency on each system they are certified to operate. Additionally, JPM recertification is required every two years. Operator recertification requirements are found in TE-LOP-553. Results of operator recertifications will be maintained on file by the applicable manager.

## **8. ACCOMODATION AND ENVIRONMENT**

Environmental working conditions will be monitored, controlled and recorded when they are deemed to be causing adverse influence on the quality of results. For NRT monitors this will be accomplished by establishing error limits on the NRT monitors that will ensure that the results generated by the NRT monitors are accurate. NRT monitors error limits can be found in the Monitoring Configuration Control Plan. For analytical instruments, every attempt will be made to maintain the operating temperatures specified by the vendor. Laboratory limiting conditions of

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operations are found in Appendix A, Section 8. QC samples will be used to verify operational control in the event that temperatures exceed those recommended by the vendor.

Laboratory analyses are segregated by type to ensure validity of sample results and maximize accuracy. Incompatible activities are separated. Laboratory and plant access is limited. All visitors must enter through the administrative area and sign in. QC standards are used for calibration and/or calibration verification only. Records corresponding to QC standards are identified and controlled. The ergonomics of laboratory and monitoring work environments are evaluated by the TOCDF Industrial Hygienist in accordance with CDRL 20, *Occupational Health and Hygiene Plan*. Housekeeping requirements are found in individual LOPs and PRP-LA-002, Analytical Safety Requirements. It is the analytical and monitoring manager's responsibility to ensure these requirements are met.

TOCDF Computer Support maintains computer and automated equipment to ensure proper function under environmental and operating conditions necessary to maintain integrity.

### 9. MONITORING STANDARDS AND CONTROL LIMITS

#### 9.1. Department of Health and Human Services (DHHS)

The Centers for Disease Control and Prevention (CDC) Public Health Service, DHHS, has responsibility by PL 91-121 to oversee the Demilitarization Program and make recommendations for protecting human health and safety. On October 9, 2003, CDC published new nerve agent airborne exposure limits (AELs) to be implemented. On May 3, 2004, CDC published new mustard AELs.

#### 9.2. DA Standards

The DA has promulgated monitoring standards and exposure levels for chemical agents in the following documents:

- DoD 6055.9-STD, *Ammunition and Explosive Safety Standards*
- Army Regulation (AR) 385-61, *Army Toxic Chemical Agent Safety Program*
- AR 50-6, *Chemical Surety*
- DA Pamphlet (Pam) 385-61, *Toxic Chemical Agent Safety Standards*
- DA Pam 40-8, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Nerve Agents GA, GB, GD, and VX*
- DA Pam 40-173, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Mustard Agents H, HD, and HT*
- PMCD Pam 40-1, *Occupational Health Guidelines for the Evaluation and Control of Occupational Exposure to Lewisite*.

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- Federal agencies such as the U.S. Environmental Protection Agency (USEPA) and Occupational Safety and Health Administration (OSHA) also require monitoring for the presence of hazardous chemicals in ambient air to ensure that site workers and the surrounding communities are not exposed to hazardous conditions during excavation, transportation, storage, and disposal of chemical materiel, and during emergency response activities. OSHA regulations are codified in the Code of Federal Regulations (CFR), Title 29 CFR, Part 1910.120 (29 CFR 1910.120). Primary USEPA regulations incorporate OSHA standards by reference and are codified in Title 40 CFR Part 311.

### 9.3. AELs and Process Control Levels

AELs for chemical warfare agents at short-term exposure limits (STEL), worker population limits (WPL), General Population Limits (GPL), Immediately Dangerous to Life and Health (IDLH), Vapor Screening Limit (VSL) and Source Emission Limits (SEL) can be found in the LMQAP, Section 7. These will be applied at TOCDF in accordance with Table 9-1:

**Table 9-1. TOCDF AEL Levels**

	GB mg/m <sup>3</sup>	VX mg/m <sup>3</sup>	H-agents mg/m <sup>3</sup>
STEL			
(15-Minutes)	0.0001	0.00001	0.003
WPL <sup>1</sup>			
(12-Hours)	0.00002	0.0000006	0.00027
WPL <sup>2</sup>			
(8-Hours)	0.00003	0.000001	0.0004
WPL <sup>2</sup>			
(4-Hours)	0.00003	0.000001	0.0004 <sup>C1</sup>
SEL	0.0003	0.0003	0.03
IDLH			
(30-Minutes)	0.1	0.003	0.7
VSL	0.0001	0.00001	0.003

#### Notes:

<sup>1</sup> The 12-hour WPL monitoring level will be used for routine historical monitoring.

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<sup>2</sup> The 8-hour WPL monitoring level will be used for LSS air monitoring regardless of actual sample time.

### 10. EQUIPMENT AND REFERENCE MATERIALS

#### 10.1. Introduction

For continuous Emission Monitoring Systems (CEMS) operational requirements, refer to the protocol in CFR, Title 40, Part 60, Appendix F and the Handbook, August 1997, *Continuous Emission Monitoring System for Non-criteria Pollutants*, Center for Environmental Research Information, National Risk Management, National Research Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, OH 45268 and Attachment 20, CEMS Monitoring Plan.<sup>C1</sup>

Table 10-1 identifies general laboratory/monitoring requirements for equipment and reference materials.

The laboratory will properly maintain all equipment required for the correct performance and operation of agent and CEMS monitors. All maintenance procedures will be documented. Each item of equipment used to acquire a critical measurement will be labeled, marked, or otherwise identified to indicate its calibration status. If equipment is calibrated before use or calibration is not required, equipment will be labeled accordingly. Records and documentation will be maintained on all equipment and reference standards that have a significant impact on the calibration, operation, or performance of the agent monitoring/analysis systems or CEMS. Records shall be maintained on all laboratory equipment including as a minimum:

- Nomenclature
- Manufacturer
- Serial Number or other unique identification number
- Date received
- Date placed into service
- Current location, if appropriate
- Condition when received (e.g., new, used, reconditioned, etc...)
- Copy of O&M manuals
- Dates and results of calibrations and dates of next scheduled calibration
- Details of maintenance performed and maintenance activities scheduled for the future
- History of damage, malfunction, modification, or repair.

This section also describes the requirements for the preparation, handling, storage, and evaluation of standard solutions that are used for calibration and QC spiking.

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**Table 10-1. General Laboratory/Monitoring Requirements for Equipment and Reference Materials**

Laboratory/Monitoring Responsibility	Requirement
Maintenance	<ul style="list-style-type: none"><li>• Shall ensure proper maintenance of all equipment, including reference standards required for correct performance, calibration, and operation of monitoring and sampling systems</li><li>• Shall document all maintenance procedures</li><li>• Should as a minimum, perform preventive maintenance in accordance with manufacturer recommendations.</li></ul>
Spare Parts and Consumables	<ul style="list-style-type: none"><li>• Requirement shall be defined by the laboratory/monitoring group.</li></ul>
Records	<ul style="list-style-type: none"><li>• Shall be maintained for the monitoring and sampling systems and for all reference materials that have a significant impact on the calibration or performance of monitoring and sampling systems</li><li>• Shall be maintained for all TOCDF laboratory/monitoring group equipment having a significant role in sample analysis.</li></ul>
Labels/Identification <sup>a</sup>	<ul style="list-style-type: none"><li>• Shall indicate the calibration status of each item of equipment</li><li>• Shall indicate equipment required to be calibrated before use and equipment that does not require calibration.</li></ul>

<sup>a</sup> For monitoring equipment this information can be contained in the logbook.

### **10.2. Use of Chemical Agent Standard Analytical Reference Material (CASARM) Standards (or other government provided agent standard).<sup>C2</sup>**

#### **10.2.1. Introduction**

For the purpose of this document and the quality management system used at TOCDF the term CASARM refers to actual CASARM material or any other government provided agent standard that is to be used for the calibration. Challenge or preparation of QC samples to be used in the monitoring system.<sup>C2</sup>

The Army has established a program for maintaining purified chemical warfare agent reference standards. These<sup>C1</sup> purified chemical agent materials are defined as Chemical Agent Standard Analytical Reference Materials (CASARM). Supporting

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documentation (chain-of-custody records and certification statements) including agent, amount, lot number, purity, and method of purity determination accompany each shipment. The most recent purity, as determined by the CASARM group, will be used as the actual purity of the CASARM for all calculations. The TOCDF Laboratory will submit a request to the TOCDF Field Office for submission to CMA to receive chemical agent standards at least 60 days in advance of the need for such standards. In the event CASARM standards are not available, TOCDF will perform purity analysis on neat agent and this purity will be used to prepare working standards. Field office approval for this purity determination will be required.

### 10.2.2. CASARM Proficiency Program (PTP)

The CASARM Quality Assurance Team (CQAT) has implemented a proficiency testing (PT) program to assist chemical disposal laboratories in eliminating bias and inaccuracy. The TOCDF Laboratory will participate in this program when directed. A Sample Custodian will receive samples.<sup>C1</sup>

#### 10.2.2.1. Sample Preparation

Depending on the initial analytical results determined from direct injection analyses; the PT sample may need to be diluted to an appropriate concentration range for DAAMS and NRT monitors' analyses. If dilution is required, the PT sample will be diluted gravimetrically, maintaining four significant figures.

#### 10.2.2.2. Analysis by Direct Injection

The PT sample will be analyzed in triplicate on either a GC-FID or GC-FPD; this will be left to operator discretion. The GC will be calibrated using a three-point calibration that encompasses the given concentration range. The calibration will be verified by successfully analyzing a QL sample prior to analyzing the PT sample.

#### 10.2.2.3. NRT Monitors

PT samples will be analyzed in triplicate, on the same day. The NRT monitors will be calibrated and QP challenged prior to performing the PT. PT samples will be treated as normal QP challenges. The NRT monitors monitoring level used for PT analysis will be selected based on the concentration range determined in accordance with Section 10.2.2.1.

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### **10.2.2.4. DAAMS**

DAAMS PT samples will be treated as normal DAAMS samples but will be analyzed in triplicate, on the same day. The DAAMS method used for PT analysis will be selected based on the concentration range determined in accordance with Section 10.2.2.1.

### **10.2.2.5. Reporting Results**

Based on observed response and the known dilution scheme, the PT sample concentration will be calculated and reported for each challenge in mg/mL. The average concentration for each method will also be reported. The data will be reported to two decimal places unless directed otherwise. Results will be reported to the CQAT within 30 calendar days after the receipt of the PT samples.

### **10.2.3. Standards Handling Requirements**

Requirements for handling standards are located in DA PAM 385-61 and PMCD Policy Statement No. 49.

## **10.3. Reference Materials Description and QA/QC Procedures**

### **10.3.1. Neat CASARMS**

Neat CASARM is received by the TOCDF laboratory in quantities below the surety level for each agent. Neat CASARM shall not be stored in the TOCDF Laboratory. Neat CASARM is diluted to below RDTE dilute levels and then the remaining neat CASARM is destroyed. Neat CASARM is allowed to warm to room temperature prior opening the container. All work with neat CASARM is documented. The stated purity of the neat CASARM is the purity that is used when calculating the concentration of dilute solutions.

### **10.3.2. RDTE Dilute CASARMS**

CASARM with agent concentrations and quantities below those listed in Table 10-2 are classified as research, development, test, and evaluation (RDTE) dilute solutions. All RDTE dilute solutions will be prepared gravimetrically from CASARM or from stock solutions derived from CASARM to within 5% of the required target concentration. Working solutions (QC and calibration) will be prepared from the same parent stock. Verification solutions will be a controlled set of solutions, prepared independently from a separate stock A solution. The verification solutions will be used to verify the concentration of the working solutions and will be maintained in the lab. Only working solutions will be used for challenging and calibrating analytical and monitoring instruments. When diluting solutions, an accuracy of four significant figures

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must be maintained. Prior to dilution, all RDTE dilute solutions will be allowed to warm to ambient temperature for a minimum of 15 minutes. RDTE dilute solutions will be prepared and/or verified monthly for all agents except Lewisite. ***Lewisite standards will be prepared and/or verified weekly.***<sup>C1</sup>

**Table 10-2. Maximum Quantity and Concentrations for RDTE Solutions**

AGENT	Maximum Quantity Per Container	Maximum Concentration
GB/GA <sup>C1</sup>	20 mg	2 mg/mL
VX	10 mg	1 mg/mL
HD	100 mg	10 mg/mL

C1

### 10.3.3. Storage and Use of CASARM Solutions<sup>C1</sup>

All CASARM solutions will be stored at or below 4°C. Containers of CASARM solutions will be allowed to equilibrate to room temperature prior to being opened. The time of operations with CASARM solutions<sup>C1</sup> outside of cold storage should be minimized.

### 10.3.4. Standards for Calibration and Sample Spiking (Working Solutions)

Calibration solutions are used to calibrate the analytical and monitoring instruments that support agent monitoring and environmental analysis. QC solutions are used to verify instrument control status and method performance. QC and calibration solutions are prepared from the same stock solution, but will be vialled separately (e.g., the 1.0 Z NRT monitors calibration solution will be in a different vial than the 1.0 Z challenge solution even though they are poured from the same parent solution). Working solutions will be prepared within 5% of the required target concentration. Working solutions are prepared gravimetrically by diluting the appropriate stock solution while maintaining an accuracy of four significant figures. Verification solutions will be used to verify the precision and accuracy of the working solutions. Verification solutions will be prepared independently (i.e., different Stock A, prepared by different person) of the working solutions.

### 10.3.5. Organic Solvents and Glassware Used to Prepare Standard Solutions

As a minimum, reagent grade organic solvents are used to prepare all agent solutions. For a given procedure the grade of solvent required will be specified in the LOP. Mixing solvents from different lots will be avoided when preparing agent solutions. Upon receipt, reagents will be labeled with an expiration date, if applicable. Once opened, the container will be labeled with the date opened.

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Glassware used for standards preparation will be thoroughly cleaned and dried before use, even if it is new. Glassware cleaning procedures for standards preparation are found in TE-LOP-553.

### 10.3.6. Standard Solution Label and Record Keeping

Records shall be maintained for the preparation and destruction of all agent standard solutions. Records for each agent standard solution will be maintained and will include as a minimum: parent stock (include lot number and purity if parent was neat CASARM), solution concentration, solvent name and lot number, date prepared, expiration date, preparer's ID, amount of stock solution used, and all corresponding analytical data. RDTE dilute solutions will be under a system of record keeping that documents continuous custody. Each transfer of custody requires documentation.

Stock solutions prepared from CASARM will be labeled with agent, concentration, solvent, and the date prepared and<sup>C1</sup> expiration date.

Working solutions prepared from stock solutions will be labeled with agent, concentration, solvent, and date prepared or expiration date.

Before the end of each shift, all checked out solutions will be returned and/or accounted for. Each transfer will be documented. At the end of each shift, the custody of calibration and QC vials are transferred from the out-going custodian to the in-coming custodian. At this time an RDTE dilute solution inventory is conducted and missing vials are accounted for and documented. If missing vials cannot be accounted for TOCDF management will be immediately notified and an investigation will be initiated.

### 10.3.7. Storage and Shelf Life of Standard Solutions

Agent standard solutions will be stored at or below 4°C when not in use. Standards will be allowed to equilibrate to room temperature prior to being opened.<sup>C2</sup>

## 10.4. Analysis of Agent Standards

The purity or concentration value listed on the certificate accompanying CASARM will be used to derive the concentration of serially diluted agent standards.

## 10.5. Quality Evaluation of Agent Standards

Stock standards derived from neat CASARM will be verified by use of an internal standard for quality analysis. Working standards will be verified by a separate verification standard procedure prior to use. New verification solutions will be prepared whenever new working solutions are prepared.

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### 10.5.1. Quality Evaluation of Stock A Standards

Two Stock A solutions will be prepared independently from the same neat CASARM vial. One Agent Chemist will prepare the Stock A solution used for working solutions and a separate Agent Chemist will prepare the Stock A solution used for verification. Detailed procedures for the preparation, verification, transportation, storage, and handling of Stock A solutions are provided in TE-LOP-584.

After preparation, new Stock A solutions must have the concentrations verified. This will be performed by gravimetrically preparing a solution of Stock A and Stock internal standard. Triplicate injections will be analyzed on a GC-FID and the results averaged. Concentration results are acceptable if the relative response factor (RRF) is within 5% of the previous Stock A initial RRF and the RRF of each individual injection is within 5% of each other. The RRF is calculated using the following formula:

$$RRF = \frac{(AREA_{Agent})(CONC_{IS})}{(AREA_{IS})(CONC_{Agent})}$$

- Where:
- RRF=Relative Response Factor
- AREA=Instrument determined peak area
- CONC=Prepared Concentration
- IS=Internal Standard

Additionally, concentrations of Stock A solutions will be verified monthly. Results of the monthly verifications are acceptable if the RRF is within 5% of the initial RRF for that solution and the RRF of each individual injection is within 5% of each other. Agent concentrations of solutions will be corrected for purity using the most recent CASARM purity. If the analysis fails the above criteria, the Stock A solutions will be decontaminated and disposed of and new Stock A solutions will be prepared. If it is deemed that Stock A solutions cannot be verified, the Laboratory Manager and the TOCDF Field Office will be notified and the proper course of action will be determined. All corrective actions will be documented.

### 10.5.2. Quality Evaluation of Internal Standards

The internal standard purity will be verified at least once every six months. If the assays fail to confirm the purity within 5% of the manufacturer's listed purity, it will be repeated until the results of the last three trials are all within 5% of their average. A new standard may be prepared at any time the analyst determines<sup>C1</sup> the newly

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calculated purity of the internal standard will replace the purity listed on the manufacturer's certificate. No internal standard with a purity less than 85% will be used.

### 10.5.3. Verification of Working Solutions

Working solutions will be prepared and/or verified monthly. Results are acceptable if the relative response factor (RRF) of the solution is  $1.0 \pm 0.1$ . The RRF will be determined by comparing a working solution against a verification solution. When comparing two solutions, the concentrations of the solutions must be within the same order of magnitude. The RRF will be calculated using the following equation:

$$RRF = \frac{(AREA_{working})(CONC_{verification})}{(AREA_{verification})(CONC_{working})}$$

- Where:
- RRF=Relative Response Factor
- AREA=Instrument determined peak area
- CONC=Prepared Concentration

One or more injections will be used for automated processes and three injections will be used for manual processes. If more than one injection is used for a solution verification, the same number of injections will be used for all solutions against that verification standard. AREA then becomes the average area of the injections. Unacceptable results due to an assignable cause may be dropped. Results of solution verification will be reviewed and approved by QC prior to solutions being issued.

### 10.6. Use of Commercially Available Standards

Certified commercial chemical standards shall be maintained and stored in accordance with vendor-provided recommendations. If a certificate of analysis accompanies commercially available standards, further evaluation of the standard is not required; however, the standard must remain traceable to the certificate of analysis. If a certificate of analysis is not provided, the standard will be certified in accordance with vendor recommendations.

## 11. MEASUREMENT TRACEABILITY AND ACCEPTANCE TESTING

### 11.1. Equipment Measurement Traceability and Calibration

The TOCDF Equipment Calibration Plan (EG-016)<sup>C2</sup> documents the laboratory calibration program. Laboratory equipment used for quantitation measurement is calibrated and/or correctness of operation is

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verified prior to use. All measurements that affect quality of the system are traced to a national standard.

Reference Standards of measurement used by the laboratory are:

- Used for calibration or verification purposes only
- Calibrated by a vendor that can provide traceability to a national standard
- Traced to a national standard at a specified frequency.

### 11.2. Acceptance Testing for Laboratory and Monitoring Equipment

Acceptance testing of new analytical and monitoring equipment will be performed prior to field implementation. Acceptance testing will be performed by a certified operator. Table 11-1 provides acceptance testing requirements for new laboratory and monitoring equipment. Pre-used analytical or monitoring equipment received from other chemical demilitarization sites or other government agency are deemed to have already been acceptance tested prior to initial use and will not require additional acceptance testing but will be certified as additional instruments in accordance with Section 12.5. Table 11-2 provides optimized conditioning and re-conditioning methods for DAAMS and transfer tubes.<sup>C2</sup> Actual conditioning and reconditioning methods will be based on operational experience.

### 11.3. Systemization of NRT Monitors Connected to PDARS

After initial setup of an NRT monitor or after changes to alarm set points, agent type or monitoring level, the PDARS will undergo systemization function testing. This systemization testing will be part of the work package to install the NRT monitor. As a minimum the systemization will ensure the following requirements are met:

- For all challenges equal to greater than 1.0Z, verify PDARS system screen displays a value within 5.0% of the NRT monitors GPD reading.
- Verify the PDARS system screen displays the station number, location description of location or map showing location of monitor, and alarm status.
- Alarm printer (located in control room) prints the date, time, station number, and alarm status.
- Verify that after a challenge has cleared the NRT monitor, the NRT monitors GPD displays a value below 0.2Z and PDARS displays a reading below 0.2Z.
- Verify that when power is removed from the NRT monitors utility bus the NRT monitors continue to operate and that no alarms are activated resulting from the loss of power.

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**Table 11-1. Acceptance Testing Requirements for Laboratory and Monitoring Equipment**

Equipment	Requirements	Additional Information
General, to Include Non-GC/FPD and Non-GC/MSD Equipment	Will be specified in purchase agreement with vendor.	Arrangements, methods, and requirements will be specified in the purchase order or specification package.
NRT monitors	<p>1. Function Testing. One-hundred percent functionality testing of all NRT monitor units by the vendor.</p> <p>2. Precision and Accuracy (P&amp;A) Testing. Statistical sampling of each batch of NRT monitor units for agent or simulant Class I P&amp;A tests at 1.0Z-mass equivalent.<sup>a,b</sup> If the sampling fails acceptance criteria, the vendor will perform P&amp;A tests on 100 percent of the batch.</p> <p>3. Challenging. NRT monitors not chosen for P&amp;A testing must pass challenges of 1.0Z-mass equivalent simulant.</p>	<p>Acceptance test plan will be prepared by the vendor.</p> <p>Acceptance test report will include all data and corrective actions.</p>
GC-MSD/FPD	Perform an autotune and verify tune relative abundances to test the MSD. Inject a performance check standard designed specifically for the FPD. Verify column performance and detector response.	None
GC-FPD	Inject a performance check standard designed specifically for the detector. Verify column performance and detector response.	None

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**Table 11-1. Acceptance Testing Requirements for Laboratory and Monitoring Equipment**

NO <sub>x</sub> Pre-Filter	Verify absence of cracks, packing separation, and other physical defects.	Tube fabrication must be accomplished in accordance with laboratory-approved procedures.
PCT <sup>c</sup>	Verify absence of gaps in the sorbent material and fractures in the glass tubing.	If flow rate errors, interferent's or poor agent recoveries are encountered and are attributed to the new PCT, the new PCT shall be discarded and another new PCT shall be used. If QC data trending indicates that the PCT lot may be inadequate, the PCT vendor shall be notified for corrective actions.
Equipment	Requirements	Additional Information
DAAMS Tube Focusing Tube 3-mm Transfer Tube <sup>c</sup>	<p>Verify shipping manifest; verify absence of obvious defects.</p> <p>Pressure drop testing. Tubes must satisfy method flow rate requirements.</p> <p>All tubes shall be preconditioned before use.</p> <p>Agent testing. Selected tubes will be spiked with agent and analyzed to ensure adequate agent retention and desorption is performed.</p>	<p>Tubes will be purchased from a qualified vendor.</p> <p>TOCDF laboratory will track tubes to perform tube history to verify tube performance.</p> <p>Pressure drop testing will be performed by the manufacturer. Agent testing recoveries must satisfy QL criteria listed in Section 14.</p>
AgF Conversion Pad <sup>c</sup>	Minimum of 75 percent conversion efficiency, as determined by agent recovery	VX monitoring locations will have separate sample lines from GA and HD to ensure the AgF conversion pad does not bias GA and HD detection.
Sample Pumps	Pump flow requirements meet analytical method requirements	Pump specifications identify maximum flow rate and vacuum capacity.

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**Table 11-1. Acceptance Testing Requirements for Laboratory and Monitoring Equipment**

Sample Lines, Probes, and DAAMS Manifolds	Test new sample lines for interferences prior to introduction of agent. Verify sample lines and sample probes provide a transmission efficiency of $\geq 75$ percent.	Transmission efficiency will be demonstrated by TOCDF laboratory personnel prior to use. <sup>c1</sup>
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**Notes:**

- <sup>a</sup> Statistical sampling will be performed in accordance with American National Standards Institute (ANSI)/American Society for Quality Control (ASQC) Z1.4-1993 at General Inspection Level II with a 5 percent acceptance quality level.
- <sup>b</sup> Agent testing is preferred over simulant testing.
- <sup>c</sup> Acceptance testing will be performed in accordance with a General Inspection Level I with a required acceptable quality level of 2.5 percent or less, as defined by the ANSI/ASQC Z1.4-1993. The entire sample lot shall be rejected if the number of rejects exceeds the value allowed, as determined by the testing procedure, unless items are accepted individually (on a one-at-a-time basis).

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**Table 11-2. Optimized Parameters for Conditioning and Reconditioning Methods<sup>a</sup>**

Method <sup>b</sup>	Temperature (°C)	Time (min)	Flow Rate (mL/min) <sup>c</sup>	Least Critical Parameter
8-mm DAAMS Conditioning	195	120	100	Time
8-mm DAAMS Reconditioning	200	5	50	Flow rate
6-mm DAAMS Conditioning	205	15	550	Time
6-mm DAAMS Reconditioning	195	5	1,000	Flow rate
3-mm Transfer Tube Conditioning	220	3	50	Flow rate

**Notes:**

- <sup>a</sup> Southwest Research Institute: *Optimizing the Conditioning and Reconditioning Methods for Sorbent Tubes for ACAMS and DAAMS Analysis of GB, VX, and HD*, Final Report, February 23, 2000, Table 8.
- <sup>b</sup> Other diameter size DAAMS tubes may be used at a CMA facility. In the event a DAAMS tube is used that does not match one of the methods identified, the 8-mm DAAMS conditioning and reconditioning parameters shall be used as a starting point for developing optimized parameters.
- <sup>c</sup> Optimized flow rates are based on helium. Other gases such as air and nitrogen may be used. However, the operator should take into consideration that air may cause additional oxidation to the sorbent and the density of air and nitrogen may cause channeling of the sorbent.

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### 12. CERTIFICATION AND VALIDATION REQUIREMENTS

#### 12.1. Introduction

The laboratory performs and documents certification and validation processes for operators, instruments and methods to confirm the analytical processes are acceptable for use. Method certification for air monitoring methods will require completion of a successful P&A study and initial baseline study. Waste screening methods will require spike and recovery determinations (i.e., method detection limit (MDL) studies). Method certification will be required before the method can be used in field support operations. Method validation will be demonstrated through the continuous baseline study. Assignable cause data attributed to systemic error may be removed from P&A and baseline studies.

#### 12.2. Method Description

A method is a process that begins with the collection of a sample and is followed by analysis of the sample by an appropriate analytical technique. Method requirements specify the type of sampling media, airflow rates, collection time, the details of sample preparation, and the types and set points of instrumentation that will be used to analyze samples. Methods shall be placed under configuration control and critical parameters shall have identified tolerances that, when exceeded, will result in a "new" method.

Each monitoring and analytical method for sampling chemical agent material will be defined and documented and documentation included with the method P&A Study as follows:

- Application
  - Matrix
  - Monitoring level
  - Target analyte(s)
- Sample collection
  - Sampling device(s)
  - Flow rate
  - Aspiration time
  - Collection media (absorbent type, mesh size, bed depth).
- Sample preparation
  - Sample analysis
  - Instrument type
  - Detector type and optical filter
  - Configured instrument operational parameters (timing, temperatures, gas types, flow rates, pressures, peak parameters, error limits)

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- Column(s) (type, phase, phase thickness, length, and diameter)
- Carrier gas or mobile phase type.

### 12.3. P&A Method Certification

All methods shall successfully satisfy P&A study method certification requirements and/or waste method certification as required in Tables 12-1 and 12-2 before the method is allowed to support operations. All data from P&A studies, including method description as defined in paragraph 12.2, shall be submitted to CMA-Monitoring Office for review and concurrence before the method can support operations.

**Table 12-1. Type of P&A Method Certification**

Application	Type of Certification Required
NRT Chemical Agent Methods	Class I
<b><i>NRT Industrial Chemical Methods</i></b>	<b><i>Class A</i></b>
Historical Methods	Class I <sup>a, c C1</sup>
<b><i>Historical Perimeter Methods</i></b>	<b><i>Class I<sup>C1</sup></i></b>
Confirmation Methods	Class I <sup>a, c C1</sup>
Waste Screening Methods	Spike and Recovery <sup>b</sup>

Notes:

- a The method for GC-FPD/MSD will be fully quantitative Class I method using the FPD. The MSD will be used for qualitative purposes only by verifying ion ratios.<sup>C1</sup>
- b Method Detection Limit (MDL) Study, as defined in 40 CFR Part 136, Appendix B for the specific matrix.<sup>C1</sup>
- c If a Class I criteria cannot be met, other criteria may be implemented upon approval from the Executive Secretary.<sup>C1</sup>

When methods are identical, to include spiked mass, with the exception of the aspiration time and WPL monitoring level, only the longest sampling aspiration period shall require a P&A study. For example, a GB 4-hour WPL method with no respiratory protection and the GB 8-hour WPL method with no respiratory protection, assuming the methods are otherwise the same and the 1.0Z mass spikes are equivalent between the methods, only requires P&A certification of the GB 8-hour application.

When performing a P&A study, all sampling and analysis operations shall be performed exactly as set forth in the applicable analytical procedures. All P&A challenges will be in the form of quality plant (QP) samples. Method certification shall be performed with a representative sample matrix. Once a P&A study starts, all challenges will be part of the P&A study except for those during documented maintenance activities. For air sampling methods, the P&A challenges can be injected directly into the NRT instrument, distal end of the sample line, or sample collection media.

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If the P&A challenge is injected directly into the NRT instrument, this shall be performed at the beginning of the sample cycle and the sample line immediately reconnected (except for process areas where chemical material is present). For historical air methods, the P&A challenge shall be spiked onto the sampling media prior to air sample collection. For NRT confirmation methods, the P&A challenge may be spiked onto the sampling media before (pre-spike) or after (post-spike) air sample collection.

***Multi-agent methods (more than one agent monitored by the same instrument) shall undergo a P&A study using all analytes (injected separately or as a cocktail) with randomized analyte concentrations. The P&A will demonstrate that the analytes in a cocktail have no adverse interactions and the challenge analytes are compatible. When GB and VX analysis is conducted simultaneously, the amount of G-analog in the GB standard must be corrected; otherwise, GB and VX shall be analyzed separately. For example, for a dual-agent method A and B, challenges may consist of the following: [0.0Z A; 2.0Z B], [0.5Z A; 1.5Z B], [0.75Z A; 1.0Z B], [1.0Z A; 0.75Z B], [1.5Z A; 0.5Z B], [2.0Z A; 0.0Z B].<sup>c1</sup>***

Operators performing the study shall not be given access to the target concentration (TC) values until after the found concentration (FC) values have been reported, when practical. For quantitative methods, the concentration range must provide quantitative accuracy over the finite range of agent concentrations that the CMA laboratory is required to report. More stringent challenge levels may be specified by permit requirements, analytical method capabilities, and/or alarm level setpoint. The CMA laboratory shall request approval from the CMA-Monitoring Office to use different challenge levels than those values recommended for use.

In some cases, a Class I P&A study may not be feasible, due to lack of instrumentation, lack of trained analysts, and/or sensitivity issues associated with the chemical material. Written approval must be received from the CMA-Monitoring Office to perform a modified Class I P&A study. A Class I P&A study takes into account the variability between instruments and operators, thus demonstrating that the method can be performed by any similarly configured instrument and by any qualified and trained operator. A modified Class I study does not take into account the variability between instruments and/or operators. CMA discourages the use of modified Class I studies but will approve its use under special situations and with the following restrictions:

- ***If a modified Class I P&A study is performed with only one instrument, then that instrument will be the only one approved to run the specified method.***

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- *If a modified Class I P&A study is performed with only one operator, then that operator will be the only one approved to run the specified method.<sup>C1</sup>*

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Table 12-2. P&A Method Certification Requirements

Type of Certification	Number of Operators	Number of Instruments	Number of Days <sup>a</sup>	Target Concentrations <sup>b</sup>	Total Number of Points	Criteria
Class I	2 or more	2 or more	4	8 each at 0.0, RL, <sup>c1</sup> 0.75, 1.0, 1.5, and 2.0 times the monitoring level (Z)	48	<ul style="list-style-type: none"> <li>Target action level (TAL) is greater than the statistical calculated limit of quantitation (LOQ).</li> <li>Uncertainty in found mass (UIFM) is less than or equal to <math>\pm 25</math> percent.</li> <li>Recovery at the monitoring level is within 75 to 125 percent.</li> <li>For MSD methods, UIFM is less than or equal to <math>\pm 40</math> percent.</li> </ul>
<b>Modified Class I</b>	<b>1 or more</b>	<b>1 or more</b>	<b>4<sup>c1</sup></b>			
Class A	1	1	1	6 each at 0.1, RL, <sup>c1</sup> 1.0, and 2.0Z	24	<ul style="list-style-type: none"> <li>Estimated analytical recovery must demonstrate accuracy within <math>\pm 25</math> percent with 95 percent confidence at the monitoring level.</li> </ul>
<b>Class II</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>4 at 1.25Z, 8 each at 1.0 and 0.5Z</b>	<b>20</b>	<ul style="list-style-type: none"> <li><b>All samples at 1.25 and 1.0Z yield a positive response, as defined during method development.</b></li> <li><b>No more than 25 percent of the samples at 0.5Z yield a positive response.</b></li> </ul>
<b>Class III</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>16 at 1.0Z, 4 at 0.0</b>	<b>20</b>	<ul style="list-style-type: none"> <li><b>All challenges at 1.0Z yield a positive response, as defined during method development.</b></li> <li><b>None of the blank samples yield a positive response.</b></li> </ul>
Agent Waste Screening Methods for Waste Characterization <sup>c1</sup>	1	1	1	Minimum of 7 replicate samples at the PQL	7	Recovery and precision defined by method development.

Notes:

<sup>a</sup> Preferably consecutive days

<sup>b</sup> The laboratory must request written approval from the CMA-Monitoring Office to use different challenge levels than those values recommended for use. An RL (Action level: 0.2 Z or 0.5 Z) is required per each individual method depending on the action level at which it alarms.<sup>c1</sup>

<sup>c</sup> Statistically determined outliers, not to exceed the square root of the total number of data points, may be excluded from the set. Assignable cause data shall be repeated with documentation as to why the data point(s) was repeated.

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For Class II methods,<sup>C1</sup> a positive response shall be defined during method development and can be based on minimal signal height, minimal area counts, signal-to-noise ratios, or minimal percent recovery. Sample analyses for routine operations shall use the same definition of a positive response used in the certification process.

Data generated from a Class I P&A study shall be entered into the CMA mandated statistical program. For multi-agent methods, the program will be used to determine results for each analyte separately. The results shall be evaluated by pooling all 4 days of generated data into a single group and performing a linear regression analysis of the TC versus FC for the data population. The program shall calculate limit of quantification, uncertainty of found mass, and percent recovery. Statistically determined outliers, not to exceed the square root of the total number of data points, may be excluded from the set. Assignable cause data shall be repeated with documentation as to why the data point(s) was repeated.

### 12.4. Baseline Method Certification and Validation

All methods shall successfully satisfy the initial baseline study method certification requirements as shown in Table 12-3 before the method is allowed to support operations. All data from the initial baseline studies shall be submitted to the CMA-Monitoring Office for review and concurrence. Method validation will be demonstrated by the continuing baseline study. Failure to establish a continuing baseline study (minimum of 4 consecutive weeks of data) immediately after finishing the initial baseline study will require repeating the initial baseline study.

CMA recognizes that for certain projects/operations the above baseline requirements are impractical or impossible to implement. CMA has created alternate baseline requirements as shown in Table 12-4. For routine depot surveillance operations, alternate baseline requirements are acceptable. CMA-Monitoring Office written approval is required before implementation of the alternate baseline requirements and will be based on the length of the project/operation, type of operation, and monitoring strategy.

When performing the baseline studies, all sampling and analysis operations shall be performed exactly as set forth in the applicable analytical procedures. All challenges will be in the form of QP samples. For air sampling methods, the baseline challenges can be injected directly into the NRT instrument, distal end of the sample line, or sample collection media. For NRT methods, if the challenge is injected directly into the instrument, the challenge shall be performed at the beginning of the sample cycle and the sample line will be immediately reconnected (except for process areas where chemical materiel is present). For historical air methods, the challenge shall be spiked onto the sampling media prior to air sample collection. For NRT confirmation methods, the challenge may

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be spiked onto the sampling media before (pre-spike) or after (post-spike) air sample collection.

During baseline studies, sampling of incinerator exhaust (furnace ducts and common stack) shall be performed in a similar way as when chemical agent operations are being performed and shall require that the primary or secondary chamber of the furnace (or any furnace for the common stack) be at its operating temperature. Challenges shall be injected through the stack sampling system (where used).

For NRT stations failing two consecutive challenges (F1 and F2), corrective action shall be implemented and monitoring shall be considered unable to support operations until the instrument is back in control or a conforming NRT system is placed into service. Preventive maintenance may be performed at any time during baseline studies.

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**Table 12-3. Baseline Performance Criteria**

Application	Challenges <sup>a</sup>	Performance Standard for Each Analyte
NRT- STEL Collocated with DAAMS	Daily, each station <sup>b</sup>	Statistical response rate at the alarm level $\geq 95$ percent for each station and a first challenge pass rate $\geq 75$ percent
NRT – SEL <sup>C1</sup> Common Stack	6 times daily, each station <sup>b</sup>	Statistical response rate at alarm level $\geq 95$ percent for each station and first challenge pass rate $\geq 75$ percent for each station
NRT – Process Area	Daily, each station <sup>b</sup>	Either challenge pass rate $\geq 75$ percent for each station
NRT – Mobile Station <sup>c</sup>	Initial: One for each station Continuing: Each station within a time interval 4 hours $\pm$ 30 minutes from the last challenge <sup>C1</sup> and at the end of the workday or operation	QP FC is $\pm 25$ percent of TC
Historical and Other Class I Methods	Each method daily, rotating stations with each station challenged at least once every 28 days. At the common stack a historical QP sample and a corresponding "A" tube will be collected for analysis once every 4 hours for each agent being monitored. <sup>C1</sup>	Statistical response rate at reportable limit $\geq 95$ percent for each method, data for all stations pooled together by method
<b>Historical – Perimeter</b>	<b>Each method daily, rotating stations</b>	<b>Statistical response rate at reportable limit <math>\geq 95</math> percent for each method, data for all stations pooled together by method<sup>C1</sup></b>
Confirmation of NRT – Common Stack and Process Effluents	Daily each method and each station <sup>b</sup>	Statistical response rate at reportable limit $\geq 95$ percent for each method, data for all stations pooled together by method
Confirmation of NRT – Agent	Each method daily, rotating stations with each station challenged at least once every 28 days <sup>d</sup>	Statistical response rate at reportable limit $\geq 95$ percent for each method, data for all stations pooled together by method <sup>C1</sup>

**Notes:**

- <sup>a</sup> All challenges at 1.0Z of monitoring level for each analyte the station monitors. Daily NRT STEL challenges must be performed<sup>C2</sup> with a minimum of 12 hours from the last challenge and NRT SEL stations must be within the time interval of 4 hours  $\pm$  30 minutes from the last challenge.<sup>C1</sup>
- <sup>b</sup> When multiple near real-time (NRT) monitors are used to sample the same location, each instrument shall be considered its own station.
- <sup>c</sup> A mobile station is comprised of NRT instruments and sampling points that change location in accordance with operational requirements to include real-time analytical platforms (RTAPs) and first entry monitoring.
- <sup>d</sup> Challenges are spiked before or after sampling period and are equivalent to the mass of analyte at 1.0Z collected during one complete cycle of the NRT monitor.

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**Table 12-4. Alternate Baseline Performance Criteria<sup>a</sup>**

<b>Application</b>	<b>Challenges<sup>b</sup></b>	<b>Performance Standard for Each Analyte</b>
<b>NRT – Chemical Agents/Industrial Chemicals</b>	<p><b>Initial:</b> One for each station<sup>c</sup></p> <p><b>3-Day Initial:</b> Three challenges per day for each station<sup>c</sup> (minimum 3 hours between challenges)</p> <p><b>Continuing:</b> Each station<sup>c</sup> every 4 hours <math>\pm</math> 30 minutes and at the end of the workday or operation (If a successful 3-day initial baseline has been completed, then one challenge per day for each station<sup>c</sup>)</p>	<p>QP FC is <math>\pm</math>25 percent of TC</p> <p>Either challenge pass rate = 100 percent and first challenge pass rate <math>\geq</math> 80 percent or statistical response rate at the alarm level <math>\geq</math> 95 percent.</p> <p>If after 3 days, either challenge pass rate = 100 percent and first challenge pass rate <math>\geq</math> 80 percent or statistical response rate at the alarm level <math>\geq</math> 95 percent can be demonstrated, then a minimum of one daily challenge per station will be required.</p> <p>If the equipment has been taken offline (turned off or placed in standby mode), a successful challenge is required before the equipment can support operations.</p>
<b>NRT – Chemical Agents/Industrial Chemicals – Mobile Station<sup>d</sup></b>	<p><b>Initial:</b> One for each station<sup>c</sup></p> <p><b>Continuing:</b> Each station every within a time interval 4 hours <math>\pm</math> 30 minutes from the last challenge 4 hours and at the end of the workday or operation</p>	<p>QP FC is <math>\pm</math>25 percent of TC</p>
<b>Historical, Class I Methods</b>	<b>Each method daily, rotating stations</b>	<b>QP FC is <math>\pm</math>40 percent</b>
<b>Confirmation of NRT</b>	<b>Each method daily, rotating stations<sup>e</sup></b>	<b>All challenges provide positive response.</b>
<b>Confirmation of Historical</b>	<b>Daily, rotating stations and methods</b>	<b>All challenges provide positive response.<sup>c1</sup></b>

**Notes:**

- <sup>a</sup> CMA-Monitoring Office written approval is required before implementation.
- <sup>b</sup> All challenges at 1.0Z of monitoring level for each analyte the station monitors. Daily challenges must be performed with a minimum of 12 hours from the last challenge.<sup>c1</sup>
- <sup>c</sup> When multiple NRT monitors are used to sample the same location, each instrument shall be considered its own station.
- <sup>d</sup> A mobile station is comprised of near real-time (NRT) instruments and sampling points that change location in accordance with operational requirements to include real-time analytical platforms (RTAPs) and first entry monitoring.
- <sup>e</sup> Challenges are spiked before or after sampling period and are equivalent to the mass of analyte at 1.0Z collected during one complete cycle of the NRT monitor.<sup>c1</sup>

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### 12.4.1. Initial Baseline Study

Initial baseline studies demonstrate the readiness of the monitoring system to support operations. No method shall be allowed to support operations until it can successfully satisfy the initial baseline study method certification requirements. During this period (or sooner), all sampling lines shall demonstrate a recovery of  $\pm 40$  percent of the TC (at the applicable monitoring levels) when challenged at the distal end.

The initial baseline study consists of air method challenges for a consecutive 28-day period. Performance standards and challenge frequencies shall be as specified by Table 12-3. Because construction/systemization activities during this period may affect or prevent certain monitoring operations, the following shall be considered:

- Initial baseline data shall be entered into the CMA mandated statistical program (see Section 18). A report from each initial baseline study shall be transmitted to the CMA-Monitoring Office for review and concurrence.
- Each NRT station is an independent baseline study. Passing or failing the initial baseline will be on a per station basis and not on a global basis. Not all stations need to be in the same 28-day window.
- Each historical and confirmation method is an independent baseline study, but each station may affect more than one method and all stations using that method shall be included. Passing or failing the initial baseline will be on a per method basis. Not all methods need to be in the same 28-day window.
- A minimum of 20 days of data in a 28-day period is required for each initial baseline study. Excluding days from the study is only allowed if construction/systemization activities or other operations prevented the daily challenge or if a challenge is excluded due to documented assignable cause (for example, use of the wrong standard).
- If an initial baseline study is failing, the study can be extended, as improvements are made and corrective actions take effect, shifting the 28-day window accordingly.

***The alternate initial baseline consists of the following:<sup>C1</sup>***

- ***For 1-day operations or daily operations in which the monitoring systems are taken offline (shutdown or put on standby) at the end of the workday, a successful initial baseline is passing one QP challenge for each NRT***

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*station and each historical and confirmation method as specified by Table 12-4. The initial baseline shall be repeated each operational day before the monitoring system can support operations.<sup>C1</sup>*

- *For continuous operations or where the monitoring systems are not taken offline at the end of the day, a successful initial baseline will consist of a consecutive 3-day period for each NRT station and each historical and confirmation method as specified by Table 12-4.<sup>C1</sup>*
- *Initial baseline data shall be submitted to the CMA-Monitoring Office as part of the continuing baseline data.<sup>C1</sup>*

### 12.4.2. Continuing Baseline Study

The continuing baseline study validates the long-term performance of the monitoring system and starts immediately after successful completion of the initial baseline.

Continuing baseline requirements:

- Each NRT station is an independent baseline study. Passing or failing the continuing baseline will be on a per station basis and not on a global basis.
- Each historical and confirmation method is an independent baseline study. Passing or failing the continuing baseline will be on a per method basis.
- Failing to meet the performance standards described in Table 12-3 will require corrective action and additional QPs until the problem is resolved. The problem and corrective action shall be documented in a Corrective Action Report, which shall be submitted to the CMA-Monitoring Office within 7 days after the end of the reporting period.
- For historical or confirmation stations failing a QP challenge, corrective actions will be required and daily QP challenges will continue until the problem is resolved and a passing QP challenge is obtained for that station. These diagnostic QP challenges shall not be included in the baseline studies, but shall be reported as part of the Corrective Action Report.
- All sampling lines, except those used to monitor toxic<sup>C1</sup> process areas, shall be tested every 2 months to demonstrate a recovery of  $\pm 40$  percent of the TC (at the applicable monitoring level) when challenged at the distal end. ACAMS may be used to verify DAAMS sample lines. This is the preferred method due to immediate knowledge of pass/fail

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results and will allow corrective action to be taken in a more time efficient manner.

- Certified operators shall participate in the continuing baseline study.
- All continuing baseline data shall be transmitted to the CMA mandated statistical program every 2 weeks.

### ***Alternate continuing baseline requirements:<sup>C1</sup>***

- ***For NRT stations, QP challenges will be required at the beginning of the work day, every 4 to 5 hours, and at the end of the workday or operation. If after 3 days all challenges are successful (P1 or P2) and first challenge pass rate is greater than or equal to 80 percent or a statistical response rate at the alarm level greater than or equal to 95 percent can be demonstrated (or having successfully completed a 3-day initial baseline), then only one daily challenge per station will be required (except mobile stations, which shall continue with challenges every 4 to 5 hours and at the end of the work day).<sup>C1</sup>***
- ***For NRT stations failing two consecutive challenges (F1 and F2), operations supported by this station will be suspended until the problem is resolved and a passing challenge is obtained.<sup>C1</sup>***
- ***For historical or confirmation methods, one daily QP challenge shall be required for each method, rotating stations. Failing QP challenges will require corrective actions and additional QP challenges until the problem is resolved.<sup>C1</sup>***
- ***For sample line challenges during first entry operations, a monthly QP challenge should be performed to support entry operations.<sup>C1</sup>***
- ***All continuing baseline data shall be transmitted to the CMA-Monitoring Office every 2 weeks.<sup>C1</sup>***

### **12.4.3. Baseline Recertification**

Cessation of monitoring activities (taking equipment offline and/or stop doing QPs) greater than 60 days for any NRT station, historical method, or confirmation method shall require repeating the initial baseline study and re-establishment of the continuing baseline for that particular station and/or method. All the initial baseline requirements shall apply. Cessation of NRT monitoring activities for less than or equal to 60 days will require recertification in accordance with Table 12-5. Cessation of historical and confirmation methods less than or equal to 60 days

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does not require recertification. Common stack recertification data shall be submitted to the CMA mandated statistical program.

**Table 12-5. Continuing Baseline Recertification Requirements**

Application	Number of Days Suspended	Number of Challenges <sup>a</sup> Required	Performance Standard
NRT	1 to 10	1	±25 percent of TC
NRT – Common Stack	1 to 10	6 daily <sup>b</sup>	All challenges ±25 percent of TC
NRT	11 to 30	2 <sup>c</sup>	All challenges ±25 percent of TC
NRT – Common Stack	11 to 30	6 daily for two days <sup>b</sup>	All challenges ±25 percent of TC
NRT	31 to 60	4 <sup>c</sup>	All challenges ±25 percent of TC
NRT – Common Stack	31 to 60	6 daily for five days <sup>b</sup>	Statistical response rate ≥ 95 percent

Notes:

<sup>a</sup> All challenges at 1.0Z of monitoring level

<sup>b</sup> Challenges shall be 3 to 5 hours apart.

<sup>c</sup> Successive

### 12.5. Certification of Additional Instruments and Operators

Once a Class P&A study has been completed the instruments and operators who performed the study are considered certified. Additional instruments are considered certified for the method by configuring the instrument in accordance with the approved method and calibrating the instrument for that method. Additional operators may be certified by ensuring the instrument is configured in accordance with the approved <sup>C2</sup> method and performing a calibration and successfully analyzing three blind QC samples against their curve. ***If a modified P&A is performed using only one operator and/or instrument only that operator and/or instrument is considered certified for that method. Additional operators and/or instruments will require an additional P&A study to become certified. If more than one operator and /or instrument is used for the modified P&A study the component containing the variable (e.g., two operators, one instrument) certification of additional operators would be performed by calibrating and analyzing three blind QC solutions but certification of additional instruments would require a new P&A study.***<sup>C1</sup>

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### 13. CALIBRATION AND TEST METHODS

#### 13.1. General Requirements

Measurement and test equipment such as analytical balances, thermometers, thermocouples, mass flow meters and mass flow controllers are covered in the TOCDF Calibration Plan. Calibration requirements for NRT monitors and analytical instruments are defined in the individual laboratory operating procedures. Analytical results obtained from outside laboratories are reviewed by the quality control group. This is to verify that the work is performed in accordance with recognized national standards, when applicable.

#### 13.2. Chemical Agent Calibrations

***Multi-agent methods (more than one agent monitored by the same instrument) will employ calibrations using each analyte injected separately.*** Chemical Agent<sup>C1</sup> Calibration Data shall be formatted to support storage and retrieval. Calibration records shall identify the following:

- Chemical name
- Date and time
- Instrument ID number
- Name or unique ID number of operator
- Calibration standard ID number(s) (traceable back to stock solution(s)).

##### 13.2.1. DAAMS GC-FPD

The DAAMS GC-FPD will be calibrated as a fully quantitative Class I method. The DAAMS GC-FPD will be calibrated when no calibration exists, following a failed ICV, or following the failure of two successive CCV samples in accordance with Section 14.2.2.2. The DAAMS GC-FPD will be calibrated with a minimum of a three-point agent calibration plus a solvent blank to determine potential contamination. The solvent blank will not be used for calculating the best-fit line. For HD, a log function will be used to determine linearity of the HD curve. The calibration range will include a level at or below the RL for every method analyzed on that calibration. Out-of-control calibration points that can be attributed to an assignable cause may be reanalyzed and will not be used in determining the best-fit line. Up to four injections of the low calibration standard may be used to appropriately weight the low end of the calibration curve. If four injections of the low calibration standard are made, one of the four may be dropped

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from the calibration. The linear regression of the calibration curve must demonstrate a correlation coefficient  $\geq 0.995$ . Failure to meet this criterion will result in performing a new calibration. Calibration samples will be injected onto DAAMS tubes. All samples will be traceable to a calibration curve.

### 13.2.2. DAAMS GC-MSD/FPD

The method for GC-MSD/FPD will be calibrated as a fully quantitative Class I method using the FPD and the MSD will be used for qualitative purposes only by verifying ion ratios. The FPD will be calibrated in accordance with Section 13.2.1. Table 13-3 lists the recommended ion ratios and will be used as a starting point to verify ions. The ratios may change based on operational experience. The DAAMS GC-MSD/FPD will be calibrated when no calibration exists, following a failed ICV, or following the failure of two successive CCV samples in accordance with Section 14.2.2.2. Mass calibration/MSD tuning will be performed prior to agent calibration of the MSD/FPD to assure the MSD is optimized for mass identification. Perfluorotributylamine (PFTBA) will be used to perform the MSD tune. Table 13-1 lists the MSD tune acceptance criteria. If the tune criteria cannot be met or electron multiplier voltage is too high (i.e.,  $> 2800$ ), preventive maintenance will be performed. After a successful mass calibration the MSD will be challenged with bromofluorobenzene (BFB). Acceptance criteria for a BFB challenge is listed in Table 13-2. After a successful BFB challenge is performed the instrument will be challenged with agent. Each agent challenge injection must have an ion ratio in accordance with Table 13-3, or the ion ratios determined by operational experience.

**Table 13-1. PFTBA Tune Acceptance Criteria**

Atomic Mass Units (AMU)	% Relative Abundance*	Isotope Ratio
69	100	AMU 70: 0.54-1.6
131	$\geq 35$	NA
219	$\geq 30$	AMU 220: 3.2-5.4

- The target relative abundance values will be adjusted to allow the MSD to pass the PFTBA verification.

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**Table 13-2. BFB Verification Acceptance Criteria**

Target Mass	Comparison Mass	Mass Ratio Range (%)
50	95	15-40
75	95	30-60
95	95	100
96	95	5-9
173	174	0-2
174	95	50-100
175	174	5-9
176	174	95-105
177	176	5-9

**Table 13-3. Initial Suggested Acceptable Ion Ratios**

GB		
Ion	Comparison ion	Acceptable Ratio %
81	99	6-20*
99	99	100
125	99	17-42
VX		
Ion	Comparison ion	Acceptable Ratio %
114	114	100
127	114	10-20
139	114	1-6
167	114	2.5-5 <sup>C†</sup>
HD		
Ion	Comparison ion	Acceptable Ratio %
109	158	320-528
111	158	118-196
158	158	100
160	158	52-86
GA		
<i>Ion</i>	<i>Comparison ion</i>	<i>Acceptable Ratio %</i>
<b>70</b>	<b>70</b>	<b>100</b>
<b>133</b>	<b>70</b>	<b>30-56</b>
<b>162</b>	<b>70</b>	<b>22-42<sup>C†</sup></b>
VX (as G-analog)		
Ion	Comparison ion	Acceptable Ratio %
81	99	32-53
99	99	100
111	99	21-61

\* When evaluating sample and QP results, Ion 81 (GB, VX) and ion 111 (VX) may be eliminated if significant background interferences are present.

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### 13.2.3. ACAMS Calibration

ACAMS calibrations will be performed when no calibration exists, if required by corrective action, cessation of monitoring activities greater than 60 days, if the instrument has been turned off for more than 10 days, or at the discretion of the operator. ACAMS calibrations will consist of two or more 1.0 Z injections with at least one blank cycle between each injection. A calibration will be acceptable if the following criteria are met:

- The instrument has accepted two or more calibration challenges.
- The second calibration point yields a FC within  $\pm 25\%$  of 1.0 Z. For second calibration points that yield a FC between 10% and 25% of 1.0 Z, the Monitoring Team Leader must be notified to determine if preventive action must be taken to yield a calibration point within  $1.0 \pm 0.1$ .
- After the ACAMS has been successfully calibrated, the calibration will be verified by challenging with a 1.0 Z QP challenge. The QP must yield a FC within  $\pm 25\%$  of 1.0 Z and have a carryover less than 0.2 Z.

### 13.2.4. Calibration of Instruments Used For Waste Screening Applications

Analytical instruments used for waste screening methods will be calibrated when no calibration exists, when required by corrective action and after the failure of 2 consecutive CCV samples. The instrument will be calibrated with a minimum three-point agent calibration plus a solvent blank to determine potential contamination. The solvent blank will not be used for calculating the best-fit line. For HD analyzed on a GC-FPD, a log function will be used to determine linearity of the HD curve. The calibration range will include a level at or below the Practical Quantitation Limit (PQL) for every method analyzed on that calibration. Out-of-control calibration points that can be attributed to an assignable cause may be reanalyzed and will not be used in determining the best-fit line. Up to four injections of the low calibration standard may be used to appropriately weight the low end of the calibration curve. If four injections of the low calibration standard are made, one of the four may be dropped from the calibration. The linear regression of the calibration curve must demonstrate a correlation coefficient  $\geq 0.995$ . Failure to meet this criterion will result in performing a new calibration.

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### 13.3. Specified Physical Measurement Equipment

Cleaning and replacement of critical orifices and/or needle valves will be required on an as needed basis. Critical orifices and/or needle valves shall be function-checked daily with the use of a calibrated flow meter. Flow meters and flow controllers used to support critical measurements shall be within the dynamic flow range of the method and shall be calibrated at site ambient conditions at least once every 360 days. The flow controllers used to control the flow of support gasses for the NRT monitors will not be calibrated as these measurements are not critical and are function checked daily by performing the daily QP challenge. This verifies the ability of the ACAMS to fully quantify chemical agent with the current flow controller settings.

### 13.4. Calibration of Non Agent Analytical Instrumentation

Non- agent analytical instrumentation will be calibrated in accordance with the requirements of the applicable SOPs.<sup>C1</sup> This includes but is not limited to the IC, ICP-MS and pH meters.

## 14. QC SAMPLE REQUIREMENTS

### 14.1. Introduction

All instruments used for the analysis of chemical agents or industrial chemicals shall be subject to periodic QC sample analysis for each chemical the instrument will analyze to check the process from sample collection through analysis. Table 14-1 provides a summary of QC challenge requirements.

### 14.2. Air Method QC Samples

#### 14.2.1. NRT Methods

All NRT instruments will be challenged at the frequencies identified in Tables 12-3 **and 12-4**. All challenges will be in the form of QP samples. QP samples can be injected at the distal end of the sample line or directly into the instrument. QP challenges will be injected at the beginning of the sample cycle. If the challenge is injected directly into the instrument, the sample line will be immediately reconnected unless the area monitored is contaminated with chemical agent. When using a V to G conversion pad assembly to directly challenge the NRT sample inlet, allow conversion time to occur (30-60 seconds) then reconnect the sample line. Stations equipped with a stack sampling system (i.e., PAS NRT stations) shall be challenged through the stack sampling system.

The QP challenge shall deliver the same mass of analyte ( $\pm 5$  percent) to the instrument as would be collected if the instrument were sampling air containing agent at 1.0Z during the NRT

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sampling and analysis cycle. ***Instruments monitoring more than one analyte shall be challenged for each analyte.***<sup>c1</sup>

Some process area stations will require challenging when the instrument is already detecting agent. In this case, the QP challenge shall be acceptable if the challenge result is within  $\pm 25$  percent of the sum of the spiked concentration plus the average of two cycles prior to the injection of the QP and two cycles immediately after the QP response, or the sample line can be disconnected and the system allowed to clear prior to performing the challenge. Special care must be used when using this technique. The NRT monitor must clear to a level where the QP challenge will not be masked by the contamination. For a normal use of this challenge method the NRT monitor must clear to below 0.5Z. If the NRT monitor will not clear below 0.5Z the team leader must be notified and the challenge results approved by a quality control representative prior to placing the instrument back on line. For instances where the NRT will not clear to a level that will not mask a 1.0Z challenge a higher challenge level may need to be used. The use of a higher challenge level requires both Monitoring Management and Quality Control concurrence. If the line is disconnected, an acceptable challenge will be  $\pm 25$  percent of the TC.

### 14.2.1.1. NRT QP Challenge Protocol

- Perform first challenge.
  - If the QP challenge meets the acceptance criteria, record as P1 and collect the required data.
  - If the QP challenge fails the acceptance criteria, record as F1, perform second challenge or perform corrective actions if the second failure is imminent.
  - If the P1 QP challenge result is between 0.75Z and 0.85Z, preventive action may be performed.
- Perform second challenge.
  - If the QP challenge meets the acceptance criteria, record as P2 and collect the required data.
  - If the QP challenge fails the acceptance criteria, record as F2 and perform corrective action.
  - If the P2 QP challenge result is between 0.75Z and 0.85Z, preventive action may be performed.

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- Perform corrective action.
  - If the QP challenge is outside of 0.75-1.25 Z then the<sup>C1</sup> monitoring system at this station shall be considered unable to support operations until the problem is resolved and the instrument is back in control.
  - Continue performing corrective action until a passing QP greater than 0.85Z is observed; record as P3 and collect the required data.
- Perform preventive action
  - The monitoring system at this station is able to monitor to support operations but imminent failure is suspected if preventive actions are not taken. Coordinate with control room and follow corrective action protocol to ensure QP results are > 0.85Z. Challenges after preventive actions are recorded as P.

### 14.2.1.2. Data Collection for NRT Methods.

The following information will be recorded for each NRT QP sample:

- Identification: Instrument ID number, station location, and/or station ID number
- Challenge: Name or unique ID number of the individual performing the challenge, analyte, date and time of challenge, exact volume and ID number of the QC standard solution used to spike the sample, and target concentration
- FC.

### 14.2.2. Historical/Confirmation Methods

#### 14.2.2.1. QP Samples

All historical/confirmation method challenges shall be performed in accordance with the frequencies identified in Tables 12-3 **and 12-4**. All challenges will be in the form of QP samples. Historical QP samples shall be prepared by spiking analyte onto the sampling media in the laboratory prior to aspiration, placed at the sampling station for a full aspiration cycle, then analyzed at the laboratory within 72 hours of sample completion. Confirmation QP samples shall be prepared by spiking analyte onto the sampling media in the laboratory after aspiration. For on-demand confirmation configurations,

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QP samples may be aspirated when initiated by an NRT alarm. All confirmation QP samples shall be analyzed in the laboratory within 72 hours of sample completion.

Historical QP samples shall contain the same mass of analyte ( $\pm 5$  percent) as would be collected if the sample were aspirated with air containing agent at 1.0Z during the entire sampling cycle. Confirmation QP samples shall contain the same mass of analyte ( $\pm 5$  percent) as would be collected if the sample were aspirated with air containing agent at 1.0Z during one complete cycle of the collocated NRT. ***Methods monitoring more than one analyte simultaneously shall be challenged for each analyte separately.***<sup>C1</sup> A historical or confirmation station failing a QP challenge shall require corrective action and additional daily diagnostic QP challenges until the problem is resolved. These diagnostic QP challenges shall not be included in the baseline studies, but shall be reported as part of the Corrective Action Report.

### 14.2.2.2. Quality Laboratory (QL) Samples

All laboratory instruments (GC-FPD, GC-MSD, etc.) used for analysis as part of a historical or confirmation method shall be challenged with QL samples (initial calibration verification samples [ICV] and continuing calibration verification samples [CCV]). Class I methods will have an ICV sample immediately following an instrument calibration. The ICV target concentration shall be within the calibration range. All samples will be batched by method, instrument, or calibration range. Each batch will start and end with a CCV and shall include a CCV sample for every 20 samples analyzed. If more than one monitoring level is covered in the batch, the CCV spike mass shall alternate between levels. Additionally, a CCV will be analyzed after each failed QP sample. The CCV target concentration shall be equivalent to the monitoring level for each method. Failing the CCV requirements listed in Table 14-1 requires corrective actions (analysis of duplicate samples or appropriate data qualification) for all samples after the last in-control CCV.

The TOCDF laboratory has implemented the use of double blind QL samples for Class I DAAMS methods. Quality Control personnel will spike a DAAMS tube with a known volume and concentration of dilute chemical

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agent. The blind QL sample will be introduced into the sample batch and should meet the acceptance requirements specified in Table 14-1. Double blind QL results will be reviewed and tracked the same as normal QL samples. The frequency of insertion of double blind samples will be at the discretion of the Laboratory Quality Manager.

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**Table 14-1. Summary of QC Challenge Requirements**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
NRT Agent	QP	<ul style="list-style-type: none"> <li>▪ After calibration</li> <li>▪ Daily (minimum 12 hours between challenges)</li> <li>▪ <b><i>Twice daily for L monitors (minimum of 6 hours between challenges)<sup>C1</sup></i></b></li> <li>▪ After F1, unless corrective actions are taken</li> <li>▪ After preventive action or preventive maintenance</li> <li>▪ After corrective action</li> <li>▪ After an agent alarm at ACAMS with collocated DAAMS, on the alarming instrument only</li> <li>▪ At the discretion of the operator</li> <li>▪ For mobile stations, within the time interval of every 4 hours <math>\pm</math> 30 minutes from the last challenge,<sup>C1</sup> and at the end of the workday or operation</li> <li>▪ <b><i>More frequently if required by Table 12-4<sup>C1</sup></i></b></li> </ul>	1.0Z $\pm$ 5 percent	<ul style="list-style-type: none"> <li>▪ FC within <math>\pm</math>25 percent of the TC</li> <li>▪ Carryover must be less than 0.2Z</li> </ul>	<ul style="list-style-type: none"> <li>▪ See NRT QP Challenge Protocol, Section 14.2<sup>C1</sup></li> </ul>

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**Table 14-1. Summary of QC Challenge Requirements (Continued)**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
NRT Agent – Common Stack	QP	<ul style="list-style-type: none"> <li>▪ After calibration</li> <li>▪ 6 times per day (4 hours <math>\pm</math> 30 minutes) from last challenge<sup>C1</sup></li> <li>▪ After F1, unless corrective actions are taken</li> <li>▪ After preventive action or preventive maintenance</li> <li>▪ After corrective action</li> <li>▪ After an agent alarm on the alarming instrument only</li> <li>▪ At the discretion of the operator</li> </ul>	1.0Z $\pm$ 5 percent	<ul style="list-style-type: none"> <li>▪ FC within <math>\pm</math>25 percent of the TC</li> <li>▪ Carryover must be less than 0.2Z</li> </ul>	See NRT QP Challenge Protocol

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**Table 14-1. Summary of QC Challenge Requirements (Continued)**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
Historical/ Confirmation Class I	QP	<ul style="list-style-type: none"> <li>▪ Each method daily, rotating stations with each station challenged at least once every 28 days</li> <li>▪ Daily for each process effluent NRT confirmation station</li> <li>▪ Common Stack Historical QPs, will be collected for analysis once every 4 hours with a corresponding "A" tube.<sup>C1</sup></li> </ul>	1.0Z ±5 percent	<ul style="list-style-type: none"> <li>▪ FC within ±40 percent of the TC</li> </ul>	A station failing a QP challenge shall require corrective action and additional daily diagnostic QP challenges until the problem is resolved.

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**Table 14-1. Summary of QC Challenge Requirements (Continued)**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
Historical/ Confirmation Class I (continued)	QL	<ul style="list-style-type: none"> <li>▪ ICV immediately following an instrument calibration</li> <li>▪ CCV at beginning and end of batch and one every 20 samples analyzed per batch.</li> <li>▪ Immediately following failed QP</li> </ul>	<ul style="list-style-type: none"> <li>▪ ICV within calibration range</li> <li>▪ CCV at the monitoring level (if more than one monitoring level, alternate between levels)</li> </ul>	<p>Found mass for samples &gt; 0.3 ng shall be within <math>\pm 15</math> percent (<math>\pm 30</math> percent for MSD) of target. For samples <math>\leq 0.3</math> ng the found mass shall be within <math>\pm 35</math> percent.</p>	<p>If the average percent recovery of two consecutive out-of-control CCV samples is <math>\leq 50</math> percent, implement corrective action, analyze duplicate samples, and<sup>C1</sup> use appropriate data qualification for all samples after the last in-control CCV. If the average percent recovery of two consecutive out-of-control CCV samples is &gt; 50 % only those samples with a found amount &gt; 0.5 RL must be re-analyzed.<sup>C1</sup></p>

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**Table 14-1. Summary of QC Challenge Requirements (Continued)**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
Waste Screening	QL	<ul style="list-style-type: none"> <li>▪ ICV immediately following an instrument calibration</li> <li>▪ CCV at beginning and end of batch and one every 20 samples analyzed per batch.</li> </ul>	Within calibration range	Found mass shall be within $\pm 15$ percent ( $\pm 30$ percent for MSD) of target	If the average percent recovery of two consecutive out-of-control CCV samples is $\leq 50$ percent, all samples since the last in-control CCV shall be re-analyzed. If the average percent recovery of two consecutive out-of-control CCV samples is $> 50\%$ only those samples with a found amount $> 0.5$ RL must be re-analyzed. <sup>C1</sup>

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**Table 14-1. Summary of QC Challenge Requirements (Continued)**

Application	QC Type	Frequency During Operational Periods	Target Concentration	Acceptance Criteria	Failed Challenge Requirements
	MS/MSD	<ul style="list-style-type: none"> <li>▪ One matrix spike per batch of 20 samples or less</li> <li>▪ One matrix spike duplicate for each matrix spike</li> </ul>	PQL	<p>Method-specific accuracy and precision</p> <p>MS and MSD duplicate shall have a RPD <math>\leq 25</math> percent with a minimum percent recovery of 20%. All data will be corrected based on the matrix spike recovery.<sup>C1</sup></p>	Following two consecutive failing matrix spike and matrix spike duplicates, the samples must be re-analyzed and a new matrix spike and matrix spike duplicate must be prepared.

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### 14.2.2.3. Laboratory Control Samples for Historical/Confirmation Methods

Blank and duplicate samples will not be routinely analyzed for DAAMS historical/confirmation methods. They may be used as troubleshooting tools for specific instances.

### 14.2.2.4. Data Collection for Historical/Confirmation Methods

The following information will be recorded for each historical/confirmation QP sample:

- Same information collected for routine samples and recorded on the sample chain-of-custody (COC) sheet
- Identification: Sample ID number, station location and/or station ID number
- Aspiration: Date and time of aspiration, flow rates(beginning and ending),<sup>C1</sup> and sampling media
- Challenge: Name or unique ID number of the individual performing the spiking, analyte, exact volume and ID number of the QC standard solution used to spike the sample, whether spiking was performed before or after sample aspiration, and TC
- Date and time analyzed, instrument number, analyst, and FC.
- The following information will be recorded for each historical/confirmation QL sample:
- Aspiration: Aspiration media, sampling media or type (DAAMS or transfer tube)
- Challenge: Name or unique ID number of the individual performing the spiking, analyte, exact volume and ID number of the QC standard solution used to spike the sample, TC
- Date and time of analysis, instrument number, and FC.

### 14.3. Waste Method QC Samples

All waste screening methods shall include QC sample analyses. A matrix spike sample (MS) and matrix spike sample duplicate (MSD) at the applicable practical quantitation limit (PQL) shall be included per batch of 20 samples or less. An ICV sample shall be analyzed immediately following an instrument calibration. The ICV TC shall be within the calibration range. CCV samples will bracket each sample or set of

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samples and are analyzed for every 20 samples analyzed. The CCV TC shall be within the calibration range. CCV results which fail the requirements listed in Table 14-1, require the re-analysis of all samples since the last in-control CCV.

### 14.3.1. *Requirements for Hydrolysate Analysis*<sup>C1</sup>

*Hydrolysate analysis is not applicable to TOCDF at this time.*<sup>C1</sup>

### 14.3.2. **Laboratory Control Samples for Waste Methods**

For liquid samples, reagent-grade water or the solvent used to make the standards will be used as a blank matrix. For solid samples, a solid that has not been exposed to or has previously been proven free of the analyte(s) being analyzed or that has been certified by a vendor as being clean may be used.

Blanks will be analyzed with each batch of samples. Duplicate samples will not be analyzed on a routine basis. They may be analyzed for troubleshooting purposes at the discretion of the Analytical Manager. Precision will be determined through the analysis of matrix spikes and matrix spike duplicates.

### 14.3.3. **Data Collection for Waste Methods**

The following information will be recorded for each waste screening QL/MS/MSD sample:

- Same information collected for routine samples and recorded on the sample COC sheet
- Identification: Sample ID number
- Challenge: Name or unique ID number of the individual performing the spiking, analyte, exact volume and ID number of the QC standard solution used to spike the sample, and TC
- Date and time of analysis, instrument number, and FC.

## 15. **OPERATIONAL CONFIGURATION CONTROL AND OPERATIONAL SPECIFICATIONS**

### 15.1. **Introduction**

Operational limits for parameters under operational configuration control and performance specifications for monitoring and laboratory equipment are documented in the Monitoring Configuration Control Plan (for monitoring) and in the method P&A or MDL package for Analytical. Method flexibility is used to adjust parameters under configuration controls provided that the quality of the data is not affected. The tolerance range for parameters under configuration control is documented in the Monitoring Configuration Control Plan (monitoring) and in the method P&A or MDL package (analytical).

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Revision of one of the identified elements outside documented tolerance limits requires the performance of a new P&A or MDL study. Tables 15-1 through 15-5 provide configuration control parameters for selected equipment.

### 15.2. NRT Monitoring Instruments

NRT parameters under configuration control are identified in Table 15-2. NRT performance specifications are identified in Table 15-3. NRT configuration control will be sufficiently maintained to ensure that actual hardware, software, and method configuration of an ACAMS can be readily retrieved for every certified instrument so each instrument has a complete configuration history. Procedures will be maintained detailing the change procedure, validation procedure, approval authority, and documentation requirements. All configuration changes will be thoroughly documented.

### 15.3. GC-Detector Systems

The GC and detector parameters under configuration control are listed in Table 15-4. GC and detector system performance specifications are identified in Table 15-5.

### 15.4. Software Configuration Control

All laboratory/monitoring group software will be maintained under configuration control in accordance with PRP-LA-007. As a minimum, software developed by the TOCDF laboratory/monitoring group will include the following information:

- Name or identification code of the programmer
- Descriptions of the program
- Conditions of operation
- All calculations and algorithms
- Time, date, and description of appropriate program modifications.

New software packages and software developed by the laboratory/monitoring group shall be validated/tested and documented in accordance with PRP-LA-007.

Configuration control will be maintained for the NRT monitor software. The Monitoring Manager will establish written protocols for modifying NRT monitor programs, assigning review and approval authority, and identifying acceptance testing. However, if backward capability does not exist, the previous version of software shall be maintained for data reprocessing, review, etc.

Configuration control of the software used for integration systems and laboratory information systems is maintained and documented. Changes in versions of software that affect the integration of GC data will require certification and approval by the applicable CMA project manager and

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CMA-Monitoring Office. Changes in software must have previous version capabilities, or a copy of the previous software must be maintained.

If an instrument is replaced with an instrument using a different data format, operating system, etc., then the laboratory/monitoring group shall maintain the capability to access the data for a minimum period of 3 years.

The Laboratory Information Management System (LIMS) and data control center will be designed and operated to prevent unauthorized access to computer records.

When LIMS raw data are collected, analyzed, processed, or maintained, laboratory/monitoring group management shall ensure that comprehensive testing of LIMS performance is conducted at least once every 24 months or more frequently as a result of software or hardware changes or modifications.

**Table 15-1. Configuration Control Parameters for Selected Monitoring Equipment**

Equipment	Configuration Control Parameters
DAAMS Tube	Sorbent type, mesh size, sorbent bed depth, flow rate, aspiration time
AgF Conversion Pad	Materials of construction, conversion/transfer efficiency: $\geq 75$ percent, AgF pad storage to minimize photo-degradation and moisture loading. Two pads are required for each assembly. <sup>C1</sup>
NO <sub>x</sub> Prefilter	Materials of construction
Sample Line	Length, diameter, location of distal end, heat-trace requirements to include amps per foot, filters, flow rate, materials of construction
Tube Desorption Unit	Flow rates, temperature

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**Table 15-2. Configuration Control Parameters for NRT Instruments**

Parameter Type	Specific Parameter
Timing	Column T1, Column T2, Cycle, Purge, Sample, Zero, Inject, Desorb
Flow Rates	Hydrogen, Nitrogen, Air, and Sample
Error Limits	Hydrogen, Nitrogen, Air, Sample, PMT Voltage, Valve Temperature, PCT Low Temperature, PCT High Temperature, Column Low Temperature 1, Column Low Temperature 2, Column High Temperature 1, Column High Temperature 2
Temperature	Flame, Ambient, FPD, Valve, PCT Low, PCT High, Column Low Temperature 1, Column Low Temperature 2, Column High Temperature 1, Column High Temperature 2
Gas Type	Hydrogen, Nitrogen, Sample, Air, Helium
Peak Parameters <sup>a</sup>	Agent Gate Width, Cal-H, PMT Voltage
PCT	Sorbent type, mesh size, sorbent bed depth
Column	Phase, internal diameter, length, film thickness
Detector	Type; optical filter

Note:

<sup>a</sup> The calibration height will vary, depending on NRT performance, agent mass, and PMT voltage and will be recorded on each calibration data sheet.

**Table 15-3. NRT Instrument Method Operational Specifications**

ACAMS/ <i>MINICA</i> <i>MS</i> <sup>®C1</sup>	
Parameter	Minimal Criteria
PMT Voltage	<1,000 volts for ACAMS <i>and 1,250 volts for MINICAMS</i> <sup>C1</sup>
Cycle Time	ACAMS/ <i>MINICAMS</i> <sup>C1</sup> analysis time must satisfy DA Pam 385-61 monitoring requirement of 15 minutes or less analysis time.
Agent Gate	Bound a 2.0Z agent gate peak

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**Table 15-4. Parameters for GC and Detector Instruments**

Parameter Type	Parameter
Pressure	Pressure program (if applicable), heartcut settings
Temperature	GC inlet, column, detector block, temperature program, Dynatherm temperatures
Mode	Phosphorus or sulfur (FPD only), selective ion monitoring or full scan (MSD only), ionization mode (MSD only), absorbance level (GC-AED)
Column	Phase, internal diameter, length, film thickness
Pre-column/Guard Column	Phase, internal diameter, length, film thickness
Flow Rate	Hydrogen, helium, air, nitrogen, Dynatherm flows <sup>a</sup>
Peak Parameters	Area reject, threshold, peak width, any additional integration functions used during the certification
Detector	Type; optical filter

Note:

<sup>a</sup> Gas quality/tolerances will be in accordance with manufacturer recommendations.

**Table 15-5. GC and Detector System Performance Specifications**

Instrument	Minimal Criteria
Retention Time	Agent peak retention times must be within the Retention Time Window <sup>C1</sup> (RTW) <sup>a</sup> .
Challenge	Once calibrated, a QL shall demonstrate an FC within $\pm 15$ percent of the TC for non-GC/MSD methods ( $\pm 30$ percent of the TC for GC/MSD methods).

Note:

<sup>a</sup> Challenges shall be in the form of an initial calibration verification (ICV) or continuing calibration verification (CCV) sample. For Class II methods, a laboratory spike shall be used to challenge the system. U.S. Environmental Protection Agency (USEPA) method 8000B is recommended as an approach for determining the RTW and should be used in conjunction with method development.

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### 16. SAMPLE HANDLING, STORAGE AND ANALYSIS

#### 16.1. Sample Traffic Procedures

Laboratory Operating Procedures are maintained that detail procedures to accurately record the possession, chain of custody, and handling procedures for each sample from collection through disposal.

#### 16.2. Sample Collection

Individuals collecting samples shall follow published USEPA-approved procedures (*Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods*, [SW-846] most current version) and/or site-specific procedures, as approved by state or local agencies. The individual collecting the sample shall initiate the transfer of possession and sign the sample collection record. The following types of information, as a minimum, shall be recorded on the sample collection record: (Some items may not be applicable to all types of sampling procedures.) (1) unique sample ID, (2) date and time, (3) start and stop flow rates or solid/liquid collection times, (4) start and stop times of the sampling period, (5) weight (gram [g]) or volume (milliliter [mL]) (Weight may be determined by personnel performing the analysis), (6) collection location, (7) operator's name or unique ID number, (8) agent and monitoring level, (9) sample type, and (10) preservatives. Deviations from procedures, security, and unusual environmental conditions shall be included in the sample collection record.

#### 16.3. Sample Identification

A unique sample ID number will be affixed to the sample or sample container or the sampling documentation will be detailed enough to be tracked back to that individual sample and provide adequate sample identification. Permanent ink must be used to prepare labels and complete associated paperwork to ensure full protection and continued legibility of recorded data.

#### 16.4. Receipt of Samples at the Laboratory

Sample recipients will be trained in the receipt, handling, protection, and retention of samples. The sample recipient shall ensure that all samples are accounted for, undamaged, and properly labeled; damaged samples will be documented on the associated paperwork.

The sample analysis schedule is based on the priority of samples. Priority of sample analysis is determined by lab management and the control room. Records are maintained that identify the analyst and instrument used to produce sample analysis results. DAAMS samples are tracked by a bar code system and<sup>C1</sup> shall be analyzed within 72 hours of sample completion. Samples results from samples analyzed outside of 72 hours will have those results annotated. Waste screening samples shall be analyzed in accordance with their specific holding time requirements. Samples used for the confirmation of agent have priority over all other samples.

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### 16.5. Sample Storage

The laboratory/monitoring group is responsible for sample storage to ensure that all environment, security, and holding time requirements are met. Samples will either be in the possession of a trained technician or stored in a secure area.

### 16.6. Offsite Shipment

Agent samples collected for offsite shipment and analysis will be handled in accordance with AR 50-6 and DA Pam 385-61. All samples will be verified < the Waste Control Level (WCL) in accordance with TE-LOP-572 prior to being shipped offsite for further analysis.

### 16.7. DAAMS Sample Analysis

DAAMS samples will be analyzed at the CAL for agent in accordance with TE-LOP-562 and TE-LOP-567. DAAMS tubes and the corresponding transfer tubes will be discarded for samples yielding results greater than 150% of the highest DAAMS GC-FPD calibration standard.

#### 16.7.1. Routine Samples

Routine DAAMS samples will be analyzed using a fully quantitative Class I method within 72 hours of the ending aspiration time. If a DAAMS sample is not analyzed within 72 hours, the data will be annotated and any report will be annotated with a statement that the sample exceeded the hold time and will include actual time between the end of aspiration and analysis.

In an attempt to track low level agent migration, routine DAAMS samples "A" tubes may initially be analyzed on GC calibrated for NRT confirmation analysis. When "A" tube analysis yields results above the high calibration standard the "B" tube will be analyzed on an instrument calibrated at a range that encompasses the RL for the specific sample. Under these circumstances the "B" tube will become the primary monitor and the results associated with the "B" tube will be the results that are reported to the CON. This approach will allow TOCDF to determine low level agent migration in areas where agent is not suspected and allow corrective actions to be taken long before the agent levels pose a risk. "A" tubes may also be analyzed on a calibration curve that encompasses the RL for the individual sample. In this case the "B" tube analysis will be required when agent is detected on the "A" tube above the RL. The "B" tube will be analyzed on an instrument with a different analytical column configuration (i.e., dissimilar phase) or detector configuration that is calibrated to encompass the RL for the individual sample. Under these circumstances the result yielding the highest value will be reported as the primary monitor.

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Changes in sample volume caused by instrument malfunction or human error may account for an individual sample to have an RL below the required calibration range. Under these circumstances the analyst may have to extrapolate beyond the calibration curve to approximate the found amount. These results will be annotated to indicate that the RL was below the calibration range and will include a statement on the validity of the data. DAAMS sample results will be considered potentially positive if the area response corresponds to an adjusted found concentration (AFC)  $\geq$  RL determined by the continuing baseline studies. The AFC is calculated by dividing the FC by the current QP grand mean percent recovery provided the method demonstrates a negative bias, grand mean  $\leq 100\%$ .<sup>C1</sup> For a method which demonstrates a positive bias, the FC will be reported. A CCV will be analyzed immediately after a potentially positive DAAMS sample.

Common stack samples and MDB filter stack samples will be analyzed on a routine basis, even though the corresponding ACAMS did not alarm. One Common Stack sample will be analyzed for each 4 hours sampled. Filter Stack samples will be collected every 12 hours and analyzed. Each common stack sample will have a corresponding QP which will be analyzed on the same GC as the "A" tube. Once every 24 hours a QP will be aspirated on the filter stack and will be analyzed on the same GC as the corresponding "A" tube. If sample results from the "A" tube indicate the presence of an interferant in the agent window with a result  $\geq$  RL the corresponding "B" tube will be analyzed on either the GC-MSD/FPD or a GC-FPD with a different column (i.e., dissimilar phase). The instrument which the "B" tube will be analyzed on is determined by the mass of interferant determined by the "A" tube analysis. After enough data has been accumulated, the collection and analyses of these non-alarming ACAMS/DAAMS samples may be discontinued with approval from Executive Secretary of Utah Solid and Hazardous Waste Control Board. Refer to Section 17.8 for reporting analytical results.

### 16.7.2. Confirmation Samples

Confirmation samples or group of samples will be bracketed by in-control QLs.

#### 16.7.2.1. Historical Confirmation Samples

Historical confirmation will be required when the "A" tube yields an actual found concentration of agent greater than or equal to the action level.<sup>C1</sup> The "B" tube will be analyzed on a GC-FPD with a different analytical column (i.e., dissimilar phase), or on the GC-MSD/FPD.

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The "B" tube will be analyzed on a calibration curve that encompasses the actual found concentration of the A tube. If the calibration curve for the A tube had been exceeded, the B tube should be analyzed with a calibration curve that encompasses the approximate concentration.<sup>C1</sup> For GC-FPD analysis, agent will be considered present if the "B" tube yields a positive response at or above the action level.<sup>C1</sup> For GC-MSD/FPD analysis, agent will be considered present if the "B" tube yields a positive response<sup>C1</sup> (as determined by the FPD response) above the action level<sup>C1</sup> and the ion ratios are present in accordance with the criteria listed in Table 13-3. Written procedures are maintained for determining which analytical instrument will be used for analyzing the "B" tube. If the "A" tube is analyzed on a high sensitivity calibration and yields a result  $\geq$  the high calibration point the "B" tube value will be reported as the primary monitor and will be a confirmed reading if the "B" tube results are  $\geq$  the RL for the individual sample. If both the "A" and "B" tubes are analyzed on a calibration range that encompasses the RL for each sample both values will be reported. When agent is confirmed from a DAAMS analysis, the results will be reported in accordance with Section 17.8.

### 16.7.2.2. NRT Confirmation Samples

#### a) Short Term Exposure Limit (STEL) Confirmation Samples

For STEL ACAMS alarms the "A" tube will be analyzed on a GC-FPD with a different analytical column (i.e., dissimilar phase) than the alarming ACAMS or on the GC MSD/FPD. For GC-FPD analysis agent will be suspected if the AFC of the "A" tube is  $\geq$  RL. Positive GC-FPD results will require confirmation analysis of the "B" tube. For GC-MSD/FPD analysis, agent will be considered present if the FPD signal yields an AFC  $\geq$  RL and the ion ratios are present in accordance with the criteria listed in Table 13-3. Positive GC-MSD/FPD do not require confirmation analysis. If the "A" tube yields a result  $\geq$  RL on the GC-FPD, the "B" tube will be analyzed on the GC-MSD/FPD or on a GC-FPD with a different column configuration (i.e., dissimilar phase). The "B" tube will be analyzed on a calibration curve that encompasses the RL for the

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individual sample. For "B" tube analysis, agent will be considered present if the GC-FPD yields an AFC  $\geq$  RL. For GC-MSD/FPD analysis, agent will be considered present if the "B" tube yields an AFC  $\geq$  RL (as determined by the FPD response) and the ion ratios are present in accordance with the criteria listed in Table 13-3.

### b) Source Emission Limit (SEL) Confirmation Samples

For SEL ACAMS alarms the "A" tube will be analyzed on a GC-FPD with a different analytical column (i.e., dissimilar phase) than the alarming ACAMS or GC MSD/FPD. For GC-FPD analysis agent will be suspected if the AFC of the "A" tube is  $\geq$  RL. Positive GC-FPD results will require confirmation analysis of the "B" tube. For GC-MSD/FPD analysis, agent will be considered present if the "A" tube yields an AFC  $\geq$  RL (as determined by the FPD response) and the ion ratios are present in accordance with the criteria listed in Table 13-3. Positive GC-MSD/FPD do not require confirmation analysis. If the "A" tube yields an AFC  $\geq$  RL on the GC-FPD, the "B" tube will be analyzed on the GC-MSD/FPD or on a GC-FPD with a different column configuration (i.e., dissimilar phase). The "B" tube will be analyzed on a calibration curve that encompasses the RL for the individual sample. For "B" tube analysis, agent will be considered present if the GC-FPD yields an AFC  $\geq$  RL. For GC-MSD/FPD analysis, agent will be considered present if the "B" tube yields an AFC  $\geq$  RL (as determined by the FPD response) and the ion ratios are present in accordance with the criteria listed in Table 13-3. "C" and "D" tubes may be analyzed at the Laboratory Manager's discretion. "C" and "D" tubes will be analyzed and evaluated in accordance with the above criteria.

## 17. DOCUMENTATION

The focus of documentation is to develop and implement effective processes (documented in procedures, plans, and methods) for the QMS that will generate records, providing evidence that an activity has been accomplished or that a requirement has been achieved.

Processes are documented in the form of Laboratory Operating Procedures (LOPs), Project Regulatory Procedures (PRPs), work packages and plans. Review and approval (including changes) are required to ensure that documents

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are adequate prior to issue for use. Therefore, quality documents are controlled in accordance with PRP-DC-008, Distribution and Control of Documents, to ensure that the correct and latest requirements are available to personnel. Obsolete documents retained for legal and/or historical purposes shall be suitably marked.

### **17.1. Site Plans**

Site plans will be submitted to the CMA-Monitoring Office for review.

TOCDF has developed the following plans that apply to site-specific situations:

- CDRL 24, Laboratory Quality Control Plan (LQCP)
- TOCDF Agent Monitoring Plan (RCRA Permit, Attachment 22)
- Laboratory Operating Procedures (a complete list of LOPs is maintained on file in the laboratory)
- CDRL 18 (E002) TOCDF Personnel Training Plan
- CDRL 20, Appendix A, Laboratory Chemical Hygiene Plan
- TOCDF Waste Analysis Plan (RCRA Permit, Attachment 2)
- EG 033 CEMS Certification Quality Assurance Program Plan

### **17.2. QC Reports (Bi-weekly QP Baseline Report)**

Bi-weekly the laboratory will provide electronic QP data to the CMA-monitoring office from the initiation of the baseline survey through closure. This report shall include data, statistical reports, and corrective action reports.

### **17.3. Records**

Laboratory records are defined in PRP-LA-007, CAL Records. Records are controlled and stored in accordance with PRP-DC-004, Processing and Distribution of Reference Documents and Submittal and Storage of Records. Records will be labeled stating that after completion they will become records. Records will be uniquely identified and tracked so as to eliminate the potential loss of a record. Records that are maintained in the laboratory (or MSB) will be stored in fire-rated cabinets and transferred to the Document Control Center on a regular basis and stored in accordance with PRP-DC-004. Records containing manual calculations or handwritten data transfers will be validated by a person other than the generator (i.e., peer, manager, or QC personnel). The level of review required for individual records will be clearly defined and documented. Completed records will never be discarded by laboratory personnel; they will become part of the TOCDF operating record. When checklists or forms are used, lines or entries will not be left blank. If a section of the form is not used it will be marked accordingly. Entries made to records will be made in indelible ink. Corrections to records will be made following the industry standard error

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correction protocol of a single line through the error so it will remain legible, enter correction adjacent to the error, enter ID code and/or initials, and date the correction. Specific procedures will be maintained detailing how laboratory personnel are required to complete, handle, store, and transfer records. Records generated in support of methods which the laboratory is certified by the State of Utah will be maintained for a minimum of five years. Records of agent monitoring shall be a part of the 40-year storage requirement (29 CFR 1910.1020, OSHA, Department of Labor, 1 July 2001) and shall include the identity of personnel involved in sampling, preparation, calibration, QC challenges, and maintenance of laboratory/monitoring group instrumentation. All records shall be held secure and confidential to CMA. Records will be maintained for the purchase, receipt, and storage of consumable materials used for technical operations. The location of stored records is maintained by Document Control.

Records are used to provide information on the condition (conformity or nonconformity) of a process or product. The individual who performs the activity is responsible for documenting it. Any occurrences or conditions that may affect the results of the measurements must also be documented.

The CMA laboratory/monitoring group shall maintain records for the purchase, receipt, and storage of consumable materials used for technical operations.

### 17.4. Data Storage

A high priority should be placed on storing as much of the required information as possible in computer databases. Data stored in computer databases is backed up and archived in accordance with CDRL 11, *Laboratory Operating Plan*. The TOCDF laboratory/monitoring group maintains data storage in accordance with the 40-year requirement. Software will be maintained to access data and perform calculations for data storage to readily retrieve archived data.

### 17.5. Laboratory Operating Procedures (LOPs)

LOPs and PRPs provide the official method for performing certain routine or repetitive tasks. LOPs are maintained in accordance with PRP-DC-001, Procedure or Plan Revision, Change, or Deletion and controlled in accordance with PRP-DC-008, Distribution and Control of Documents. LOP referenced in Attachment 3, must follow the permit modification requirements.<sup>C1</sup>

**The CMA Site Project Manager or designee has approval authority on all LOPs. PRP-TR-001 defines the training, verification, and documentation process that ensures operators are familiar with LOPs through the read and sign process.<sup>C1</sup>**

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### 17.6. Quality System Plans

This LQCP will address the following items, or as a minimum, state where the information is located in other support activity documents (AMP, LOPs, PRPs, etc.):

#### 17.6.1. Development of Subordinate Plans

The information required by the following paragraphs may be contained in any number of documents and may be referenced when applicable. Each requirement does not require its own plan.

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**Table 17-1. Quality System Plans and Implementation Documents**

Requirement	Implementation Document
<ul style="list-style-type: none"> <li>• Plan for ensuring that all new sample collection and analysis work is reviewed to verify that the proper resources and facilities are available prior to commencing the work</li> <li>• Plan for requesting and approving departures from approved LOPs</li> <li>• Plan for feedback and corrective action whenever testing discrepancies are detected or departures from documented policies or procedures occur</li> <li>• Reference to contingency procedures and CMA laboratory/monitoring group limiting conditions of operation (LCOs)</li> <li>• Reference to procedures for generating and evaluating QL/QP data</li> <li>• Plan for achieving traceability of measurements</li> <li>• Reference to calibration, verification, and/or test procedures used</li> <li>• CHP in accordance with 29 CFR 1910.1450</li> <li>• Plan for protecting security of analytical results</li> <li>• Training plan and procedures for maintaining records of the relevant qualifications, training, skills, and experience of the technical personnel</li> <li>• Plan for calibration, verification, and maintenance of equipment</li> <li>• Data management plan for QA/QC procedures, including software verification</li> <li>• Plan for review, control, transfer, and release of analytical and monitoring data</li> </ul>	<ul style="list-style-type: none"> <li>• CDRL 11, Laboratory Operating Plan</li> <li>• Deviations to approved LOPs are not allowed.</li> <li>• GDL-LA-002</li> <li>• Contingency procedures are found in TE-LOP-551. LCO requirements are found in CDRL 21, Limiting Conditions of Operations.</li> <li>• Individual operating procedures, LQCP Section 14.</li> <li>• EG 016, Equipment Calibration Plan, and individual LOPs</li> <li>• Individual laboratory operating procedures, LQCP Section 17</li> <li>• CDRL 20, App A, Laboratory Chemical Hygiene Plan</li> <li>• PRP-LA-007</li> <li>• CDRL 18 (E002) TOCDF Personnel Training Plan</li> <li>• TE-LOP-553</li> <li>• Individual laboratory operating procedures</li> <li>• EG 016, Equipment Calibration Plan</li> <li>• TE-LOP-592, and TE-LOP-594</li> <li>• Software verification requirements are listed in CDRL 11, Laboratory Operating Plan</li> <li>• CDRL 11, Laboratory Operating Plan</li> </ul>

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### 17.6.2. Certification Criteria

**Table 17-2. Certification Criteria**

Requirement	Implementation Document
<ul style="list-style-type: none"> <li>• Verification practices including the CASARM PTP use of standard reference materials and internal QC schemes</li> </ul>	<ul style="list-style-type: none"> <li>• CDRL 24 (LQCP)</li> </ul>
<ul style="list-style-type: none"> <li>• Plan and criteria for certifying and recertifying agent and industrial chemical monitoring/analysis systems in baseline studies</li> </ul>	<ul style="list-style-type: none"> <li>• CDRL 24 (LQCP)</li> </ul>
<ul style="list-style-type: none"> <li>• Plan and criteria for certifying agent and industrial chemical monitoring systems not included in baseline studies</li> </ul>	<ul style="list-style-type: none"> <li>• Individual LOPs (if applicable)</li> </ul>
<ul style="list-style-type: none"> <li>• Plan and criteria for certifying and recertifying personnel operating monitoring/analysis systems</li> </ul>	<ul style="list-style-type: none"> <li>• TE-LOP-553</li> </ul>
<ul style="list-style-type: none"> <li>• Plan for configuration control of the chemical materiel monitoring/ analysis systems</li> </ul>	<ul style="list-style-type: none"> <li>• EG-080, Monitoring Configuration Control Plan</li> <li>• P&amp;A study packages</li> </ul>

### 17.6.3. Auditing and Performance Evaluation

**Table 17-3. Auditing and Performance Evaluation**

Requirement	Implementation Document
<ul style="list-style-type: none"> <li>• Procedures for addressing CMA, CMA project managers, State, and DHHS concerns on CMA laboratory/monitoring group performance</li> </ul>	<ul style="list-style-type: none"> <li>• PRP-MG-002, Control of PMCD Directed Actions</li> <li>• PRP-MG-003, Control of EG&amp;G Directed Actions</li> </ul>
<ul style="list-style-type: none"> <li>• Plan for auditing and reviewing laboratory/monitoring group functions, including procedures for maintaining audit files (reports and corrective actions)</li> </ul>	<ul style="list-style-type: none"> <li>• CDRL 24 (LQCP)</li> <li>• TE-LOP-592</li> <li>• TE-LOP-594</li> </ul>
<ul style="list-style-type: none"> <li>• Plan for capturing lessons learned about monitoring systems</li> </ul>	<ul style="list-style-type: none"> <li>• PRP-EN-030, Site Contractors Lessons Learned</li> </ul>
<ul style="list-style-type: none"> <li>• Plan and criteria for internal and external audits</li> </ul>	<ul style="list-style-type: none"> <li>• TE-LOP-592</li> <li>• TE-LOP-594</li> <li>• TOCDF does not perform third party audits. External audits are performed by the Client.</li> </ul>
<ul style="list-style-type: none"> <li>• Identification of major equipment and reference measurement standards</li> </ul>	<ul style="list-style-type: none"> <li>• CDRL 24 (LQCP)</li> <li>• Individual Operating Procedures</li> </ul>

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### 17.6.4. Regulatory Requirements

**Table 17-4. Regulatory Requirements**

Requirement	Implementation Document
<ul style="list-style-type: none"><li>• Additional and/or unique requirements established by state and federal law/regulation and/or the site environmental permits</li><li>• Scope of sample collection and analysis established by state and federal law/regulation and/or the site environmental permits.</li></ul>	<ul style="list-style-type: none"><li>• Requirements imposed by the State of Utah Division of Solid and Hazardous Waste (DSHW) will be incorporated into individual LOPs, LQCP, and/or the Agent Monitoring Plan which are all RCRA controlled Documents.</li><li>• Requirements imposed by the State of Utah Division of Solid and Hazardous Waste (DSHW) will be incorporated into individual LOPs, LQCP, and/or the Agent Monitoring Plan which are all RCRA controlled Documents.</li></ul>

### 17.7. Confirmed Responses Report

All DAAMS samples with results above the Reporting Level (RL) level will be reported to the TOCDF Control Room in accordance with Section 17.8. As a minimum, the following information is collected and maintained on file in the laboratory.

- Identification of the chemical materiel
- Sample ID Number/Sample Station
- Found concentration (FC), in mg/m<sup>3</sup>
- Associated NRT reading (if applicable)
- Date, time, and location of reading or measurement
- QC sample results supporting the analytical results
- Statement on the quality of monitoring data and printouts of the actual data
- Any chemical materiel readings at any relevant stations at the site, destruction facility, or storage facility
- Description of site operations during the sample aspiration period
- A statement of the potential chemical compound's source
- Explanation of response or operator comments
- Name/unique ID number of operator collecting and analyzing the sample
- Analytical method used for analysis
- Analytical instrument ID

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### 17.8. Sample Analysis Report

Results of laboratory sample analysis are reported accurately, clearly, and objectively. Each report is provided to the TOCDF Control Room. Each report shall be provided to CMA-Monitoring Office upon request. Reports will contain at least the following information:

- Title
- Project name and site address
- Unique ID of the report
- Report recipient name and address
- Description of each sample analyzed
- Characterization and condition of sample
- Date of sample collection and analysis
- Identification of or reference to the analytical method used
- Identification of or reference to the sampling method used
- Identifications of deviations from approved methods and other information relevant to the sample
- Analytical results supported by tables, charts, sketches or photos
- QL and QP recoveries and other appropriate QC samples for the sample collection period
- Signature and title of persons accepting responsibility for report contents
- Results identified as performed by outside labs or vendors
- Statement on chain of custody adherence
- Amendments to a report after issuance shall be made only in the form of a further document, including the statement identifying the amendment as a supplement to the report and identifying the specific title and serial number of the report being amended.

### 17.9. DAAMS and NRT Monitor Bi-weekly Corrective Action Report

Failing to meet the performance standards for continuing baseline studies will require corrective action until the problem is resolved. The problem and corrective action shall be documented in a corrective action report, which shall be submitted to the TOCDF Field Office for transmission to the CMA-Monitoring Office within 7 days after the end of the reporting period. The bi-weekly corrective action report shall include as a minimum:

- Problem to be resolved
- Initial action performed
- Planned actions performed if problem remains unresolved

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- Actions that may be taken to prevent reoccurrence of the problem.

### 18. STATISTICAL VALIDATION REPORTS

Statistical validation reports shall include QC data, statistical analysis, and corrective actions. The CMA laboratory/monitoring group shall submit the QC data to the CMA mandated statistical program from initial baseline through closure. The CMA mandated statistical program is a Web-based program and can be accessed with an appropriate account at <https://homeqa.pmc.darmy.mil/qcdrs/>. In the event the web-based program cannot be accessed TOCDF can transfer baseline data to CMA using the current INNACMO statistical software package.

#### 18.1. QA/QC Data Statistical Reports

Monthly out-of-control QL data shall be tracked by GC column type as an internal QC report and transmitted to CMA-Monitoring Office upon request.

Some statistical parameters (for example, inaccuracy, standard deviation [SD], etc.), other than those identified in Section 12, do not have acceptance criteria and are for troubleshooting purposes only.

The Web-based CMA mandated statistical program will be used to generate biweekly reports for submission to the CMA-Monitoring Office for initial and continuing baseline studies in accordance with requirements in paragraphs 12.4.1 and 12.4.2. Baseline recertification data is not required to be submitted to the statistical program with the exception of common stack data.

The TOCDF Laboratory will capture all data and track all assignable cause data for internal QA purposes. Assignable cause QP data and diagnostic QP data will be entered into the program as flagged entries and will not be used for statistical calculations. All remaining QP challenges are part of the statistical calculations.

#### 18.2. Statistical Analysis of Calibration Curve Data

Calibration curve data for the analytical equipment used in the sample measurement process shall be analyzed statistically as required by Table 13-1 or the appropriate section in Section 13.

#### 18.3. Data Validation and Qualification

The rigorous QC requirements identified throughout this plan are intended to ensure that data validation efforts are built into the overall quality process and include validation vehicles such as participation in a PTP, multiple QC samples, and internal and external audits. To ensure laboratory and monitoring data are used effectively, data qualification of laboratory and monitoring data shall be performed when data integrity has been or is suspected to have been compromised. Compromised data, meaning data captured did not satisfy applicable data quality requirements for various reasons (equipment failure, poor recoveries, disconnected sample lines, etc.) must be qualified appropriately and corrective actions shall be

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implemented to ensure that future data have probability of satisfying applicable data quality requirements.

GDL-LA-002 defines and documents the procedures for data qualification. GDL-LA-002 will address as a minimum:

- Personnel/organization responsible to perform data qualification
- Procedure for qualifying laboratory and monitoring sample data that are not bracketed by acceptable CCVs
- Procedure for qualifying laboratory/monitoring sample data that do not have acceptable QP recoveries
- Procedure for qualifying NRT data back to the last successful challenge
- Procedure for qualifying NRT data that were generated during NRT equipment failure or inappropriate configuration/setup
- Reporting procedures for compromised data.

### 18.4. Sample Statistical Report

Statistical software programs are used to aid in evaluating the performance of agent monitoring systems. The following are examples of statistical programs:

#### 18.4.1. Inaccmo.pgm Program

The *inaccmo.pgm* program calculates performance parameters for each NRT monitor using first challenge data. These performance parameters are calculated using the CMA mandated statistical program, defined in this section.

#### 18.4.2. Acomp.pgm Program

The *acomppgm* program generates a composite plot of all QP challenges for all NRT monitors.

#### 18.4.3. Staplot.pgm Program

The *staplot.pgm* program generates simple performance plots of all challenge events and indicates the corrective action taken for a given NRT monitor station.

#### 18.4.4. Perform.pgm Program

The *perform.pgm* program tabulates the pass rates by station and by the QP challenger's ID code.

### 18.5. Statistical Calculations

Statistical calculations used in the above statistical reports can be found in the LMQAP, Section 16.5.

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### 19. OUTSIDE SUPPORT AND PURCHASING

Where non-commercial grade services are required to support laboratory operations, the vendor will be required to adhere to TOCDF-imposed requirements. Non-commercial grade items and/or services will be identified and documented. Non-commercial grade items/services will only be procured from qualified vendors. All contracts/purchase orders will identify QC requirements. Written procedures are maintained in TE-LOP-553 for the purchase, receipt, and storage of laboratory consumable materials used for the technical operations of the laboratory. These procedures include any QC requirements which may be applicable to the purchase or receipt of these materials. Items that identify QC requirements will require QC review of the purchase order and QC review of the product when received. Laboratory Management will review all purchase orders for technical content.

#### 19.1. Qualified Supplier Evaluations

As directed by the EG&G Quality Manager, laboratory QC personnel will be required to evaluate the QA system and technical operations of potential suppliers. As a minimum, the evaluator will evaluate the supplier's ability to meet the requirements of the purchase order and/or request for proposal. Supplier evaluations will be repeated annually. Qualified supplier evaluations will be performed and documented in accordance with PRP-QA-003, Quality Assurance Supplier and Evaluation Assessment.

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**1. INTRODUCTION**

**1.1. Purpose**

The purpose of the TOCDF Monitoring Concept Plan is to identify the requirements of the CMA Programmatic Monitoring Concept Plan (MCP) and to describe in detail how they are incorporated into the TOCDF Quality Management system. This MCP shall be used at TOCDF for developing our Agent Monitoring Plan that incorporates additional Federal, State, and local regulatory requirements. This MCP will be submitted with the LQCP to the TOCDF Field Office for approval and submission to CMA and the Executive Secretary.<sup>C1</sup>

**1.2. Scope**

This MCP outlines minimum requirements of chemical materiel monitoring necessary to support TOCDF activities, which will include: (1) monitoring requirements for chemical warfare materiel (CWM) in air, liquid, and solid matrices; (2) monitoring levels and exposure limits; and (3) documentation requirements. This MCP is based on the requirements in the CMA Programmatic MCP, which is based on requirements defined in Department of the Army (DA) Pamphlet (Pam) 385-61. This document defines requirements for TOCDF activities and operations relating to storage, treatment, and disposal of chemical materiel as specified in Table A.1-1. Requirements for closure activities will be provided under separate guidance. If the CMA Programmatic MCP is different from or conflicts with other codes or regulations from state and/or federal authorities, the CMA is to be notified for resolution of the conflict and the most stringent requirement shall be followed, pending resolution.

All other potential chemical hazards shall be addressed by TOCDF in the industrial hygiene plan, health and safety plan (HASP), emergency response plan, or other similar documentation.

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**Table A.1-1. Applicable CWM**

Symbol	Chemical Name
H, HS	Bis-(2-chloroethyl) sulfide with polysulfides
HD	Bis-(2-chloroethyl) sulfide
<b>L</b>	<b><i>Dichloro-(2-chlorovinyl) arsine<sup>C1</sup></i></b>
T	Bis-(2-(2-chloroethylthio)ethyl ether
Q	1,2-bis(2-chloroethylthio)ethane
<b><i>Mustard Mixtures: HL, HT, HQ<sup>C1</sup></i></b>	
<b>HN-1</b>	<b><i>Bis-(2-chloroethyl)ethylamine<sup>C1</sup></i></b>
<b>HN-3</b>	<b><i>Tris-(2-chloroethyl)amine<sup>C1</sup></i></b>
GB	Isopropyl methylphosphonofluoridate
<b>GD</b>	<b><i>Pinacolyl methylphosphonofluoridate<sup>C1</sup></i></b>
<b>GA</b>	<b><i>Ethyl N,N-dimethylphosphoramidocyanidate<sup>C1</sup></i></b>
VX	O-ethyl S-(2-diisopropylaminoethyl)methylphosphonothioate
<b>DF<sup>a</sup></b>	<b><i>Methylphosphonic difluoride<sup>C1</sup></i></b>
<b>QL<sup>a</sup></b>	<b><i>O-(2-diisopropylaminoethyl) O'-ethyl methylphosphonite<sup>C1</sup></i></b>

Note:

<sup>a</sup> Monitored as non-surety industrial chemical when stored as single chemical.

Source: Army Regulation 50-6, Appendix B.

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**1.3. Program Updates**

This TOCDF MCP will be updated periodically to ensure compliance with new regulations and to accommodate technological advances. TOCDF will revise this MCP and the AMP within a time period specified by the CMA whenever: (1) the CMA Programmatic MCP is updated, (2) new regulatory guidance is promulgated, and (3) site-specific monitoring/safety requirements are implemented or changed. Revised TOCDF monitoring plans shall be submitted to the TOCDF Field Office for submission to CMA for approval.

**1.4. Waivers and Deviations**

See Section 2.1 of the LQCP.

**1.5. Responsibility and Authority**

See Section 2.2 of the LQCP.

**1.6. Monitoring System Requirements**

Information obtained from monitoring will be used to ensure that TOCDF operations are being conducted properly to mitigate a release of chemical materiel or personnel exposure.

Monitoring must be performed using instruments selected to measure the proper parameters for the specific chemical encountered at its associated monitoring level. Samples must be taken at intervals designed to ensure that useful information will be available within acceptable time limits. The instruments and methods used must be sufficiently sensitive to reliably measure threshold quantities at required levels. To accomplish these goals, instruments and methods used by TOCDF will include those specifically developed or approved by the Army to monitor chemical materiel under specific conditions in air, liquid, soils, and solids. Other methods may be used if they are more sensitive, specific, or faster and meet the requirements of the existing methods for precision, accuracy, and reliability, as described in the LQCP and upon approval by CMA.

An overriding requirement of the design and development of monitoring systems is reliable day-to-day performance. Reliability, in this context, relates to the ability of the instrument or method to perform its intended function when called upon to do so. Selection of monitoring and sampling locations is also critical to an effective monitoring program. The monitors must be positioned so that samples may be collected from representative points where any released chemical or other chemical hazard would likely be detected. Locations for ambient air monitors must be selected to provide optimum information and maximum protection for workers and the environment. Wastes must also be sampled to provide information representative of the matrix. Location requirements for monitoring systems are provided in Section 3.

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**1.7. Types of Monitoring Employed for Demilitarization and Storage Operations**

The following types of monitoring are employed for demilitarization and storage operations of CWM:

**1.7.1. Historical Monitoring**

Historical monitoring is performed to measure very low concentrations of airborne analytes, where contamination is unlikely or workers are operating without personal protective equipment (PPE). Sampling is accomplished by the collection of an air sample over an extended period of time (usually the duration of a workday) and subsequent analysis is conducted offline at the site laboratory. Historical monitoring is designed to trigger activities to investigate the source of contamination that may be found below the alarm level of the near real-time (NRT) monitor. All historical samples requiring analysis in accordance with Table A.3-1 must be analyzed within 72 hours of sampling termination.

**1.7.2. Confirmation Monitoring.**

Confirmation monitoring is performed to validate or invalidate a positive measurement from another monitoring system, either an NRT method or historical method. The NRT confirmation method must be able to measure the same mass of analyte as would be collected if the sample were aspirated with air containing agent at the monitoring level during one sampling period of the co-located NRT instrument. The historical confirmation method shall measure the amount of analyte that would be measured from the sampling duration and at the aspiration rate of the historical method for the monitoring level. Sampling is accomplished by the collection of an air sample at approximately the same sampling point as the NRT monitor or historical sampling location, and subsequent analysis is conducted offline at the site laboratory. Confirmation monitoring is used for informational, qualitative, and/or quantification data reporting purposes in the event of a chemical materiel release. The confirmation sample shall be analyzed by a different method (column or detector) than the NRT or historical method to minimize the likelihood of detecting interferences and only upon an NRT or historical method positive response. Confirmation monitoring samples shall be given priority over all routine samples.

**1.7.3. NRT Monitoring.**

NRT monitoring is conducted in areas where contamination is likely or possible, to determine airborne chemical concentration in the shortest amount of time at the monitoring level commensurate with engineering controls and worker protection. An NRT monitoring system has the capability to automatically collect, analyze, and

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report/display the results within 15 minutes when chemicals are present at or above the short-term exposure limit (STEL) concentration. NRT monitoring is also used to monitor at the Source Emission Limit (SEL), Immediately Dangerous to Life and Health (IDLH), and the Vapor Screening Limit (VSL).

**2. MONITORING STANDARDS AND CONTROL LIMITS**

Airborne exposure limits (AELs) for *tabun (GA)*, sarin (GB), *lewisite (L)*, *O-ethyl S-(2-diisopropylaminoethyl)methylphosphonothioate (VX)*, *soman (GD)*, distilled mustard (HD), Levinstein mustard (H), mustard-T mixture (HT), *nitrogen mustard (HN-1 and HN-3)*, and *mustard-L mixture (HL)*<sup>C1</sup> at STELs, worker population limits (WPLs), general population limits (GPLs), vapor screening limit (VSL), Immediately Dangerous to Life and Health (IDLH) and source emission limits (SEL) are listed in Tables A.2-1 through A.2-5.

**2.1. AELs for Chemical Agents**

Values identified in Table A.2-1 are final Centers for Disease Control and Prevention (CDC) recommendations for GA, GB, and VX. Values identified in Table A.2-2 are final CDC recommendations for HD AELs. Values identified in Tables A.2-3 through A.2-5 are time and concentration derived values. These tables provide maximum concentration values not to be exceeded for a given period of time, depending on the level of protection worn by personnel. The STEL values are short-term exposure limits. Occurrences above these short-term concentrations require immediate egress and re-entry in increased level of protection. The WPL values are long-term exposure limits. If a worker is in an area for 8 hours, the average concentration in the area for the 8-hour period should not exceed the 8-hour WPL exposure limit for the level of protection worn by the worker. If the exposure limit is exceeded, implementation of corrective actions is required. TOCDF monitors plant support areas for 12 hours at the 12-hour WPL level listed in Tables A.2-3, A.2-4, and A.2-5. TOCDF monitors LSS Air at the 8-hour WPL for GB and the 4-hour WPL for VX in accordance with Tables A.2-3, A.2-4, and A.2-5 regardless of the sample collection time.

The relationship between concentration (C) and exposure time (t) is derived for vapors and gases of VX, GB, GA, H, HD, and HT as follows:  $C^n t = k$ , where  $k = \text{constant}$  and  $0.8 \leq n \leq 3.5$ . This MCP assigns  $n = 1$  (Haber's Law) for the WPL in the range 2 to 12 hours. This assignment is both reasonable and practical: the 8-hour WPL is actually derived from a 40-hour per week exposure limit with no recovery period considered; the WPL incorporates uncertainty factors so that it is not a precise value; and Haber's Law is more easily understood because it is computationally simple.

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**Table A.2-1. AELs for GA, GB, and VX**

AEL (mg/m <sup>3</sup> )	GPL <sup>a</sup>	WPL <sup>a</sup>	STEL <sup>a</sup>	IDLH
<b>GA/GB</b>	$1 \times 10^{-6}$	$3 \times 10^{-5}$	$1 \times 10^{-4}$	0.1
<b>VX</b>	$6 \times 10^{-7}$	$1 \times 10^{-6}$	$1 \times 10^{-5}$ <sup>b</sup>	0.003
<b>Averaging Time</b>	24 hours	8 hours	15 minutes	≤30 minutes
<b>Monitoring Method for Recommended Exposure Criteria</b>	Historical <sup>c</sup>	NRT or Historical	NRT monitor	NRT monitor

**Notes:**

Airborne exposure limits (AELs) are taken from 68 FR 58348-58351 (9 October 03).

- <sup>a</sup> An additional reduction factor for statistical assurance of action at the exposure limit is not needed because of safety factors already built into the derivation of the exposure limit.
- <sup>b</sup> VX STEL has been adjusted from  $4 \times 10^{-6}$  mg/m<sup>3</sup> (up to four times per day) as proposed in the Federal Register (FR) announcement to  $1 \times 10^{-5}$  mg/m<sup>3</sup> (not more than one time per day) based on technical capabilities of existing air monitoring technologies.
- <sup>c</sup> Historical monitoring typically refers to long-term sampling and analytical methods. Air monitoring results from historical methods are not known until laboratory analyses are complete.

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**Table A.2-2. AELs for HD<sup>a</sup>**

Sulfur Mustard (H, HD, HT) <sup>b</sup> Criteria	GPL	WPL	STEL <sup>c</sup>	IDLH <sup>d</sup>
Exposure Level	0.00002	0.0004	0.003	0.7
Averaging Time	12 hours	8 hours	≤15 minutes	≤30 minutes
Recommended Monitoring Method	Historical <sup>e</sup>	Historical <sup>e</sup> or near real-time	Near real-time	Near real-time

**Notes:**

- <sup>a</sup> Although the Centers for Disease Control and Prevention (CDC) do not specifically recommend additional reduction factors for statistical assurance of action at the exposure limit, exposures to sulfur mustard should be minimized given the uncertainties in risk assessment, particularly as related to characterizing carcinogenic potency.
- <sup>b</sup> The toxicity data for agent T is inadequate for setting exposure limits. The very low vapor pressure for agent T precludes it as a vapor hazard under normal ambient conditions. For sulfur mustard and T mixtures, air monitoring for sulfur mustard alone should be sufficient under most circumstances to prevent exposure to T.
- <sup>c</sup> To be evaluated with a near real-time instrument using shortest practicable analytic cycle time. No more than one exposure per work-shift.
- <sup>d</sup> The mustard IDLH is based only on non-carcinogenic effects. No IDLH has been established for carcinogens.
- <sup>e</sup> Historic monitoring typically is used for time-weighted average (TWA) monitoring where the sample analyzed represents an extended time period, for example, 8 or 12 hours. Results are not known until laboratory analysis is completed after the sampling event. AELs using historic monitoring are set at levels at which health effects are not expected to occur for most workers. Exposures above the WPL-8, but below the STEL, likewise are not expected to result in significant health effects unless such exposures occur continuously for long periods.

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**Table A.2-3. VX AELs**

VX	Averaging Time						SEL and VSL <sup>C1</sup>
	GPL (24 hours)	WPL (12 hours)	WPL (8 hours)	WPL (4 hours)	WPL (2 hours)	STEL <sup>a</sup> (15 minutes)	
General Population	$6 \times 10^{-7} \text{ mg/m}^3$						
No Respiratory Protection		$6 \times 10^{-7} \text{ mg/m}^3$	$1 \times 10^{-6} \text{ mg/m}^3$	$2 \times 10^{-6} \text{ mg/m}^3$	$4 \times 10^{-6} \text{ mg/m}^3$	$1 \times 10^{-5} \text{ mg/m}^3$	
Air-Purifying Respirator		$3 \times 10^{-5} \text{ mg/m}^3$	$5 \times 10^{-5} \text{ mg/m}^3$	$1 \times 10^{-4} \text{ mg/m}^3$	$2 \times 10^{-4} \text{ mg/m}^3$	$5 \times 10^{-4} \text{ mg/m}^3$	
Supplied-Air Respirator w/o Escape Bottle		$6 \times 10^{-4} \text{ mg/m}^3$	$1 \times 10^{-3} \text{ mg/m}^3$	$2 \times 10^{-3} \text{ mg/m}^3$	$4 \times 10^{-3} \text{ mg/m}^3$	$1 \times 10^{-2} \text{ mg/m}^3$	
Self-Contained Breathing Apparatus or Supplied-Air Respirator with Escape Bottle		$6 \times 10^{-3} \text{ mg/m}^3$	$1 \times 10^{-2} \text{ mg/m}^3$	$2 \times 10^{-2} \text{ mg/m}^3$	$4 \times 10^{-2} \text{ mg/m}^3$	$1 \times 10^{-1} \text{ mg/m}^3$	
Demilitarization Protective Ensemble					$100 \text{ mg/m}^3$ <sup>b</sup>		
Vapor Screening Limit							$1 \times 10^{-5} \text{ mg/m}^3$
Source Emission Limit							$3 \times 10^{-4} \text{ mg/m}^3$

**Notes:**

<sup>a</sup> Exposures at the STEL shall not occur more than one time per day.

<sup>b</sup> Implemented as a ceiling value.

Airborne exposure limits (AELs) are taken from Army Regulation 385-61 (12 October 01) and 68 FR 58348-58351 (9 October 03).

All AELs are concentration and time values, not concentration only values. Administrative controls may be used to limit potential exposure to workers. However, because administrative controls cannot be used to limit the duration of potential public exposure, only the worker population limit (WPL) protective action level is significantly affected by administrative controls, which limit the duration of potential exposure.

The maximum use concentration is the product of the AEL and the assigned protection factor for the respirator. The assigned protection factors used in this table are taken from 68 FR 34036-34119.

The demilitarization protective ensemble is only authorized for use up to 2 hours (depending on temperature). The maximum use concentration is based on extensive testing performed 1975 through 1979.

The source emission limit was previously known as the allowable stack concentration.

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**Table A.2-4. GB/GA<sup>C1</sup> AELs**

GB/GA	Averaging Time						SEL and VSL <sup>C1</sup>
	GPL (24 hours)	WPL (12 hours)	WPL (8 hours)	WPL (4 hours)	WPL (2 hours)	STEL <sup>a</sup> (15 minutes)	
General Population	$1 \times 10^{-6}$ mg/m <sup>3</sup>						
No Respiratory Protection		$2 \times 10^{-5}$ mg/m <sup>3</sup>	$3 \times 10^{-5}$ mg/m <sup>3</sup>	$6 \times 10^{-5}$ mg/m <sup>3</sup>	$6 \times 10^{-5}$ mg/m <sup>3</sup>	$1 \times 10^{-4}$ mg/m <sup>3</sup>	
Air-Purifying Respirator		$1 \times 10^{-3}$ mg/m <sup>3</sup>	$1.5 \times 10^{-3}$ mg/m <sup>3</sup>	$3 \times 10^{-3}$ mg/m <sup>3</sup>	$3 \times 10^{-3}$ mg/m <sup>3</sup>	$5 \times 10^{-3}$ mg/m <sup>3</sup>	
Supplied-Air Respirator w/o Escape Bottle		$2 \times 10^{-2}$ mg/m <sup>3</sup>	$3 \times 10^{-2}$ mg/m <sup>3</sup>	$6 \times 10^{-2}$ mg/m <sup>3</sup>	$6 \times 10^{-2}$ mg/m <sup>3</sup>	$1 \times 10^{-1}$ mg/m <sup>3</sup>	
Self-Contained Breathing Apparatus or Supplied-Air Respirator with Escape Bottle		$2 \times 10^{-1}$ mg/m <sup>3</sup>	$3 \times 10^{-1}$ mg/m <sup>3</sup>	$6 \times 10^{-1}$ mg/m <sup>3</sup>	$6 \times 10^{-1}$ mg/m <sup>3</sup>	1 mg/m <sup>3</sup>	
Demilitarization Protective Ensemble					100 mg/m <sup>3b</sup>		
Vapor Screening Limit							$1 \times 10^{-4}$ mg/m <sup>3</sup>
Source Emission Limit							$3 \times 10^{-4}$ mg/m <sup>3</sup>

**Notes:**

<sup>a</sup> Exposures at the STEL shall not occur more than four times per day, and at least 60 minutes must lapse between successive exposures.

<sup>b</sup> Implemented as a ceiling value.

Airborne exposure limits (AELs) are taken from Army Regulation 385-61 (12 October 01) and 68 FR 58348-58351 (9 October 03).

All AELs are concentration and time values, not concentration only values. Administrative controls may be used to limit potential exposure to workers. However, because administrative controls cannot be used to limit the duration of potential public exposure, only the worker population limit (WPL) protective action level is significantly affected by administrative controls, which limit the duration of potential exposure.

The maximum use concentration is the product of the AEL and the assigned protection factor for the respirator. The assigned protection factors used in this table are taken from 68 FR 34036-34119, 6 June 2003.

The demilitarization protective ensemble is only authorized for use up to 2 hours (depending on temperature). The maximum use concentration is based on extensive testing performed 1975 through 1979.

The source emission limit was previously known as the allowable stack concentration.

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**Table A.2-5. H/HD/HT AELs**

H/HD/HT	Averaging Time						SEL and VSL <sup>c1</sup>
	GPL (12 hours)	WPL (12 hours)	WPL (8 hours)	WPL (4 hours)	WPL (2 hours)	STEL <sup>a</sup> (15 minutes)	
General Population	$2 \times 10^{-5} \text{ mg/m}^3$						
No Respiratory Protection		$2.7 \times 10^{-4} \text{ mg/m}^3$	$4 \times 10^{-4} \text{ mg/m}^3$	$8 \times 10^{-4} \text{ mg/m}^3$	$1.6 \times 10^{-3} \text{ mg/m}^3$	$3 \times 10^{-3} \text{ mg/m}^3$	
Air-Purifying Respirator	For sulfur mustards, air-purifying respirators are for escape purposes only.						
Supplied-Air Respirator w/o Escape Bottle		0.27 mg/m <sup>3</sup>	0.4 mg/m <sup>3</sup>	0.8 mg/m <sup>3</sup>	1.6 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>	
Self-Contained Breathing Apparatus or Supplied-Air Respirator with Escape Bottle		$2.0 \times 10^{-3} \text{ mg/m}^3$	4 mg/m <sup>3</sup>	8 mg/m <sup>3</sup>	16 mg/m <sup>3</sup>	30 mg/m <sup>3</sup>	
Demilitarization Protective Ensemble					100 mg/m <sup>36</sup>		
Vapor Screening Limit							$3 \times 10^{-3} \text{ mg/m}^3$
Source Emission Limit							$3 \times 10^{-2} \text{ mg/m}^3$

**Notes:**

<sup>a</sup> Exposures at the STEL shall occur not more than one time per day. The Centers for Disease Control and Prevention (CDC) may publish updated numbers.

<sup>b</sup> Implemented as a ceiling value.

Airborne exposure limits (AELs) are taken from Army Regulation 385-61 (12 October 01) and 69 FR 29164-29168 (03 May 04).

All AELs are concentration and time values, not concentration only values. Administrative controls may be used to limit potential exposure to workers. However, because administrative controls cannot be used to limit the duration of potential public exposure, only the worker population limit (WPL) protective action level is significantly affected by administrative controls, which limit the duration of potential exposure.

The maximum use concentration is the product of the AEL and the assigned protection factor for the respirator. The assigned protection factors used in this table are taken from 68 FR 34036-34119, 6 June 2003.

The mixture HT shall be monitored as HD.

The source emission limit was previously known as the allowable stack concentration.

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**2.2. PELs for Industrial Chemicals Used as CWM**

Industrial chemicals will not be monitored at TOCDF.

**2.3. Exposure Limit Implementation Concept**

TOCDF will monitor in accordance with guidance provided in Section 3. Monitoring levels at specific locations shall be based on potential time of exposure and shall consider the maximum use concentration for a given respirator protection factor. Under these conditions, different monitoring levels may be implemented, depending on the level of PPE used and implementation of administrative controls to reduce potential exposure times.

**3. MONITORING CONCEPTS**

**3.1. Introduction**

Monitoring shall be used to evaluate the overall effectiveness of engineering and administrative controls, and when PPE is used, monitoring shall be used to ensure that levels, as defined in Section 2, are not exceeded.

Placement of each sampling point at TOCDF shall be based on potential chemical migration points and have been verified using smoke tests. All monitoring devices used for CWM detection shall satisfy the certification and performance requirements specified in this LQCP.

**3.2. Monitoring Strategy for Incineration/Neutralization Facilities**

A summary of the monitoring strategy for incinerator/neutralization facilities is provided in Table A.3-1. Detailed discussions of the monitoring locations are provided in the following paragraphs.

**3.2.1. Process Areas**

Chemical agent contamination, in the form of vapor or liquid/vapor, is expected to be present in these areas. Process areas are areas in the facility where the CWM is being demilitarized and may include:

- Category A/B areas
- Munitions breaching areas
- CWM transfer areas
- CWM holding areas
- Reaction/neutralization areas
- Airlocks immediately adjacent to contaminated areas

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**Table A.3-1. Summary of Monitoring Strategy for Incineration/Neutralization Facilities**

Monitoring Location or Functional Activity	NRT Monitor	NRT Confirmation	Historical	Historical Confirmation	No Monitoring	Notes/Comments
Process Areas	STEL					Monitoring at levels higher than the STEL are acceptable for process areas. These monitoring levels are referred to as Engineering Control Levels (ECLs).
Process Support Areas	STEL	STEL	WPL	WPL		Historical monitoring during first 5 days of chemical agent processing and then once per month (applicable to WPL only)
Workspace Process Area	STEL	STEL	WPL	WPL		
CWM Transportation Container	VSL					Headspace monitoring
Facility Support Area			WPL		X (see comment)	Lunch/break areas within agent operating areas (that is, process area, process support area, and workspace process area) require monitoring <sup>C1</sup>
Positive Pressure Support Area					X	
Medical Vestibule	STEL					
External Support Area					X	
LSS Air Connects			WPL	WPL		
Incineration Process Vapor Effluent	SEL	SEL				
Incineration Process Solid Residue Enclosures	VSL	VSL				
<b>Neutralization Process Vapor Effluent</b>					<b>X</b>	<b>Vented into engineering controls, otherwise monitoring is required.</b>

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Table A.3-1. Summary of Monitoring Strategy for Incineration/*Neutralization Facilities* (Continued)

Monitoring Location or Functional Activity	NRT Monitor	NRT Confirmation	Historical	Historical Confirmation	No Monitoring	Notes/Comments
Filter Midbeds	VSL	VSL				
Filter Vestibule/Enclosure	STEL	STEL				
Filter Operations	STEL	STEL	WPL	WPL		
Filter Stack	VSL	VSL				
PAS Filter System	VSL	VSL			C1	
Laboratory						
Laboratory Work Area (Above Dilute RDT&E)	STEL	STEL	WPL	WPL		
Laboratory Work Area (Below Dilute RDT&E)	STEL	STEL	WPL	WPL	C1	For GA campaign, CAMDS provides all RDTE standards to TOCDF. The duration of the GA campaign is approximately one month. <sup>C1</sup>
Laboratory Filter	VSL	VSL			C1	Filter leak test required annually.
Miscellaneous						
Perimeter			GPL	GPL		
First Entry	STEL	STEL				Confirmation not immediately required
Headspace	VSL					Historical monitoring can be substituted for NRT monitoring.

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Monitoring of process areas provides information on the level of contamination and protects workers making entries into these areas. Continuous NRT monitoring at the STEL or at multiples of the STEL (i.e., ECL levels) will be utilized. The monitoring level will be selected in accordance with PPE level and administrative controls. No confirmation monitoring is necessary because the presence of chemical agent is expected

**3.2.2. Process Support Areas**

These are areas adjacent to process areas, are under some form of engineering and/or administrative control, and chemical agent contamination is not expected unless migration from the process area occurs. Process support areas may include:

- Category C areas
- Observation corridors
- Equipment rooms

Process support areas require continuous NRT monitoring at the STEL and periodic (once per month) historical monitoring at the WPL. The monitoring level will be selected in accordance with the PPE level and administrative controls, but as a standard requirement, the STEL and the WPL (consistent with the site-defined work shift) for unmasked workers shall be utilized. Confirmation monitoring is required for both the NRT and historical monitoring.

During the first 5 days of chemical agent processing, process support areas require historical monitoring at the WPL with confirmation to verify the effectiveness of the engineering and administrative controls.

Process support areas that have encountered confirmed excursions above the STEL shall require continuous WPL monitoring until corrective actions (that is, engineering control and/or administrative control changes have been performed to mitigate exposure above the WPL) have been implemented and validated.

**3.2.3. Workspace Process Areas**

In the workspace process areas single-contained CWM may be present and personnel shall perform work on a routine basis. The workspace may be adjacent to or in the vicinity of a process area. Chemical agent contamination is not expected, but because of the nature of the operations being performed in these areas, there is a potential for contamination. Workspace process areas may include the Unpack area and the Chemical Agent Transfer System (CHATS) area.

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Workspace process areas require continuous NRT monitoring at the STEL and historical monitoring at the WPL. The monitoring level will be selected in accordance with PPE level and administrative controls, but as a standard requirement, the STEL and the WPL (consistent with the site-defined work shift) for unmasked workers shall be utilized. Confirmation monitoring is required for both the NRT and historical monitoring.

**3.2.4. CWM Transportation Container**

Transportation containers, such as the onsite container (ONC) and enhanced onsite container (EONC), require headspace monitoring at the VSL prior to opening.

**3.2.5. Facility Support Area**

A facility support area is within the physical boundary of the facility, but outside agent operating areas, in an access-controlled area, and where unmasked personnel work, dress, and/or take breaks on a routine basis. Facility support areas may include:

- Category D area
- Lunch/break area
- Administrative area.

Facility support areas do not require monitoring. Lunch/break areas within agent operating areas (that is, process area, process support area, and workspace process area) require monitoring.

**3.2.6. Positive Pressure Support Areas**

Positive pressure support areas within the facility are provided with a positive pressure, filtered air environment. Positive pressure support areas may include:

- Category E areas
- Control room
- Medical facility

Positive pressure support areas do not require monitoring.

**3.2.7. Medical Vestibule**

This area within the medical facility is under engineering controls and is designed to receive potentially contaminated casualties. During processing of a casualty through the vestibule, NRT monitoring at the STEL is required. Confirmation monitoring is not required.

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**3.2.8. External Support Areas**

External support areas are work and break areas outside the facility physical boundary but within the host installation. External support areas may include:

- Administrative buildings
- Warehouses
- Maintenance buildings
- Shelter-in-place locations

External support areas do not require monitoring.

**3.2.9. Process Effluent**

Process effluent includes the streams resulting from the demilitarization of CWM.

**3.2.9.1. Incineration Process Vapor Effluent**

Furnace ducts and common stack require continuous NRT monitoring at the source emission limit with confirmation monitoring. The common stack requires continuous sampling at all times. No time gaps in the common stack sampling are allowed. Probe designs shall ensure representative sample collection.<sup>C1</sup>

**3.2.9.2. Incineration Process Solid Residue Enclosures**

The incineration process solid residue enclosures may include:

- Deactivation Furnace System (DFS) cyclone enclosure
- Heated discharge conveyor (HDC) bin enclosure
- Metal Parts Furnace (MPF) discharge airlock (only applicable during processing of secondary waste items).

Solid residue enclosures require NRT monitoring at the VSL with confirmation monitoring prior to discharge and/or release from the enclosure and/or airlock.

**3.2.9.3. Neutralization Process Effluent (Neutralents)<sup>C1</sup>**

***The liquid effluent from the chemical neutralization of agent shall be sampled and analyzed in accordance with the requirements of Section 4, Waste Streams.<sup>C1</sup>***

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**3.2.9.4. Neutralization Process Vapor Effluent<sup>C1</sup>**

*If the vapor produced by or in contact with the neutralization process is not vented into engineering controls, continuous NRT monitoring at the VSL with confirmation monitoring is required.<sup>C1</sup>*

**3.2.10. Ventilation Exhaust Filter System**

The ventilation exhaust filter system includes the facility's cascade ventilation system exhaust where CWM is processed for demilitarization. It does not include the laboratory ventilation system or other buildings in the facility where CWM is not processed. See Attachment 22, Agent Monitoring Plan and other Applicable Permit Requirements specific to TOCDF regarding Filter monitoring.<sup>C1</sup>

**3.2.10.1. Filter Midbeds**

NRT monitoring at the VSL with confirmation monitoring shall be performed in at least one midbed point in the filter, such that the filter capacity behind the midbed monitoring point adequately contains the worst-case scenario as selected from the hazard analysis. Once agent breaks through to that midbed monitoring point, the charcoal immediately downstream and all charcoal upstream shall be replaced as soon as practical. Alternating the filter midbed monitoring point with the filter vestibule/enclosure monitoring point is permitted.

**3.2.10.2. Filter Vestibule/Enclosure**

NRT monitoring at the STEL with confirmation monitoring is required during toxic entry. Alternating the filter vestibule/enclosure monitoring point with the filter midbed monitoring point is permitted.

**3.2.10.3. Filter Operations**

The area where personnel enter into midbeds or perform bag-in/bag-out operations or other maintenance operations inside the filter enclosure will be considered a toxic entry and managed under TOCDF toxic entry procedure PRP-SA-052.

**3.2.10.4. Filter Stack**

Continuous NRT monitoring at the VSL with confirmation monitoring is required.

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**3.2.11. Life Support System (LSS) Air Connects**

Daily historical monitoring with confirmation monitoring at the WPL prior to use is required. The WPL monitoring level will be the 8-hour WPL standard for GB and the 4-hour WPL standard for VX.

**3.2.12. Laboratory Work Areas**

Laboratory work areas are areas where chemical agent standards are prepared or used and/or areas where samples are analyzed that may contain chemical agent. Chemical agent contamination is not expected, but because of the nature of the operations being performed in these areas, there is a potential for contamination.

**3.2.12.1. Operations with Chemical Agent Above RDT&E Dilute Level.**

The process areas include laboratory areas where operations with chemical agent above RDT&E dilute level are conducted or where samples expected to contain chemical agent above RDT&E dilute level are analyzed. These laboratory work areas require NRT monitoring at the STEL and historical monitoring at the WPL during chemical agent operations. The monitoring level will be selected in accordance with PPE level and administrative controls, but as a standard requirement, the STEL and the WPL (consistent with the site-defined work shift) for unmasked workers shall be utilized. Confirmation monitoring is required for both the NRT and historical monitoring.

**3.2.12.2. Dilute RDT&E Operations**

TOCDF performs the same monitoring requirements as specified for above RDT&E in section 3.2.12.1 except for GA. CAMDS supplies GA standards to TOCDF. The GA campaign is expected to last less than one month.<sup>C1</sup>

**3.2.13. Laboratory Ventilation Exhaust Filter System**

See Attachment 22, Agent Monitoring Plan for TOCDF specific requirements.<sup>C1</sup>

**3.2.14. Facility/Installation Perimeter**

Facility/installation perimeter monitoring applies to host installation boundary for incineration facilities or, as a minimum, facility/storage yard boundary for neutralization facilities. The number and locations of perimeter monitoring stations will be based on site-specific conditions and shall require concurrence from the CMA-RMD. Perimeter monitoring shall be performed to

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determine if migration of CWM to the general population was encountered. Perimeter monitoring was not designed to control disposal activities or to provide early warning of an accidental release; rather perimeter monitoring will be used to record if CWM was detected outside the facility/storage yard boundaries and to promptly investigate releases beyond environmental controls. The perimeter requires historical monitoring with confirmation monitoring at the GPL level for all chemical agents being processed at the facility or stored in the storage yard. DCD currently has 11 monitoring stations for GB, VX and mustard. Monitoring for GA and Lewisite will be performed at the individual storage igloos for each agent.<sup>C1</sup>

**3.2.15. First Entry Monitoring**

First entry monitoring will be conducted, prior to personnel entry, to determine the potential contamination of an enclosed area that was previously contaminated or has not been under continuous monitoring. First entries require NRT monitoring at the STEL for one complete sampling cycle of the NRT. To ensure a clean representative sample is taken, prior to monitoring for one complete sample cycle the sample line should be purged. The monitoring level will be selected in accordance with PPE level of personnel making the entry. Confirmation monitoring is not immediately required but can be performed after the NRT response indicates possible chemical agent contamination.

**3.2.16. Headspace Monitoring**

Headspace monitoring may be used to screen samples to determine operational constraints, PPE requirements, handling precautions, etc., but will not be used for waste characterization.

Headspace monitoring shall be performed at the VSL on samples that have been bagged or contained in an agent-tight barrier of sufficient volume to permit sample air to be withdrawn while minimizing dilution with incoming air. One complete sampling cycle of the NRT monitor is required. Historical monitoring can be performed instead of NRT monitoring.

**NOTE**

**These results may not be used to support disposition of material that requires decontamination. Headspace monitoring for the purpose of decontamination verification shall follow the requirements described in paragraph 4.4.**

**3.3. *Monitoring Strategy for Non-Stockpile Facilities/Operations*<sup>C1</sup>**

***This is not applicable to TOCDF.*<sup>C1</sup>**

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**3.4. Monitoring Strategy for Chemical Activities Operations<sup>C1</sup>**

*This is not applicable to TOCDF.<sup>C1</sup>*

**3.5. Monitoring Cessation**

Confirmation monitoring may be suspended once CWM has been confirmed to be present (NRT-only monitoring will be required to verify effectiveness of corrective actions). Once corrective actions have resolved the confirmed CWM response, confirmation monitoring shall be re-instituted.

The Agent Monitoring Plan (AMP) shall describe conditions for reducing or suspending monitoring when CWM is no longer present but residual CWM contamination remains (for example, following agent changeover in a stockpile disposal facility). See Attachment 22, Agent Monitoring Plan for TOCDF specific details.<sup>C1</sup> Conditions for reducing or suspending monitoring—that is, engineering controls, administrative controls, and PPE requirements—must adequately protect worker safety and health. The AMP shall also describe conditions for resuming or increasing monitoring again (for example, removal of major equipment or reducing PPE requirements). Monitoring of past processed agents cannot be reduced or suspended from contaminated charcoal locations until all contaminated charcoal is replaced. Monitoring may then resume in support of current agent operations. Plans shall comply with DA regulations or policies to include the *Implementation Guidance Policy For Revised Airborne Exposures Limits For GB, GA, GD, GF,<sup>C1</sup> VX, H, HD, and HT* (DA, most current version).

**4. WASTE STREAMS**

**4.1. Introduction**

Throughout TOCDF operations, wastes will require sampling and analysis to document process effectiveness and to characterize waste streams prior to offsite shipment and disposal. TOCDF specific requirements are listed in Attachment 2, <sup>C1</sup>TOCDF Waste Analysis Plan (WAP).

**4.2. Sources of Waste Streams**

**4.2.1. Liquid Waste Streams.**

Liquid wastes generated during treatment operations will be sampled and analyzed as required by the following:

- Site regulations
- Waste Analysis Plan (WAP)
- Site safety plan

Liquid wastes include neutralents, mechanical fluids, spent decontamination solutions, rinse waters, laboratory waste liquids, etc.

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**4.2.2. Solid Waste Streams.**

Solid waste generated during treatment operations will be monitored and/or sampled and analyzed for chemical material contamination as required by the following:

- Site regulations
- WAP
- Site safety plan

Solid wastes include dunnage/packing materials, spent carbon, CWM debris, used PPE, etc.

**4.3. General Requirements for Monitoring Waste Materials**

Table A.4-1 provides the general requirements for monitoring waste materials.

**4.4. Decontamination Verification Monitoring**

Decontamination verification includes the following:

- The item has been surface decontaminated in accordance with LOP-532.
- The item has been bagged or contained in an agent-tight barrier of sufficient volume to permit sample air to be withdrawn while minimizing dilution with incoming air. TE-LOP-532, Decontamination Certification, contains laboratory-specific procedures that specify time and temperature requirements.
- For PPE, the item is allowed to off gas for a minimum of 4 hours at temperatures above 70°F. PPE will be monitored and marked "Cleared for Laundry." Two options are permissible for PPE being sent to the laundry. The options are either:
  - If monitoring to the STEL is used for clearing PPE for the laundry, then the laundry facility must be continuously monitored with NRT monitors for STEL concentrations and monitored periodically for WPL concentrations; or
  - If monitoring to the WPL is used for clearing PPE for the laundry facility, then no NRT monitoring or WPL monitoring is required.
- Less stringent monitoring conditions (but no less than one complete sampling cycle) may be used to determine operational constraints, PPE requirements, handling precautions, etc. These results may not be used to support disposition of material that requires decontamination.

Monitoring is performed with an NRT monitor, historical or confirmation method in accordance TE-LOP-532. The method shall meet the certification requirements specified in this LQCP.

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**Table A.4-1. General Requirements for Monitoring Waste Materials (See also TOCDF Attachment 2, WAP)<sup>c1</sup>**

Type of Waste	Required Monitoring <sup>a</sup>	Sample Collection
Liquid Wastes	The CMA laboratory shall verify that chemical material concentrations are below negotiated/approved levels. <sup>b</sup>	USEPA methods for representative sampling of liquid wastes shall be used as provided in SW-846 and/or USEPA-approved Army method.
	Wastes with unknown agent contamination levels will be screened for gross levels of agent contamination or diluted to allowed levels for the specific laboratory prior to low-level sample analysis.	Analysis will be performed on as required basis in accordance with the TOCDF Waste Analysis Plan and this LQCP.
Solid Wastes	Surface-contaminated solid waste will be analyzed for the suspected chemical material.	Samples are collected for semi-quantitative or quantitative laboratory analysis. Non-porous waste may be certified clean with the appropriate engineering controls.
	The air surrounding the waste will be monitored to verify that ambient concentrations of chemical material are below the Vapor Screening Limit.	USEPA methods for representative sampling of solid waste shall be used as provided in SW-846 and/or USEPA-approved Army method.
Complex Matrices <sup>c</sup>	Nonstandard test protocols should be developed, based on information from similar matrix analyses or bench study observations.	Sample collection will be based on test protocol results.

**Notes:**

<sup>a</sup> Waste suspected to be contaminated should be treated as contaminated waste until the analysis is complete.

<sup>b</sup> Approved levels are treatment goals as defined in site-specific monitoring plans.

<sup>c</sup> Complex matrices include multiphase matrices, a non-soluble matrix, reactive/non-quenchable, or a previously unanalyzed matrix.

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**4.5. Sample Containers**

Sample containers must be:

- Chosen according to containment required
- Compatible with U.S. Environmental Protection Agency (USEPA) requirements (USEPA 1987)
- Accompanied by chain-of-custody (COC) records at all times.

**4.6. Specific Requirements for Monitoring Wastes**

Several specific waste streams will be generated during treatment and decontamination operations. Laboratories shall develop waste screening methods in accordance with requirements specified in the CMA Programmatic LMQAP. Sites are encouraged to use the health-risk based model to establish waste screening levels as a treatment goal.

**4.7. Environmental Screening Levels for Chemical Warfare Agents and EA 2192<sup>C1</sup>**

in accordance with the TOCDF RCRA permit environmental screening for hazardous waste will be at the Waste Control Levels (WCL) identified in the Waste Analysis Plan (WAP). WCLs are listed in Table A.4-2.

**Table A.4-2. Waste Control Limits**

Agent	WCL
GB/GA <sup>C1</sup>	20 ppb
Mustard/Lewisite <sup>C1</sup>	200 ppb
VX	20 ppb
EA 2192	20 ppb <sup>C1</sup>

**5. DESCRIPTION AND REQUIREMENTS OF MONITORING AND SAMPLING EQUIPMENT**

This section summarizes the sampling and analytical equipment required for verifying control of agent migration in air and in process effluents for CMA activities. As a starting point, all hardware associated with process monitors, air monitoring equipment, and laboratory equipment will be maintained in accordance with the manufacturers' operations and maintenance (O&M) manual recommendations.

Table A.5-1 provides descriptions, operational requirements, and preventive maintenance requirements for TOCDF<sup>C1</sup> operations. Table A.5-2 provides equipment requirements for support gases.

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**Table A.5-1. Description and Requirements for Monitoring and Sampling Equipment**

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
<u>NRT Monitors:</u> <ul style="list-style-type: none"> <li>ACAMS</li> <li><b>MINICAMS®</b></li> <li><b>A/DAM</b></li> <li><b>HPD</b></li> </ul>	<u>Operational Components:</u> <ul style="list-style-type: none"> <li>Preconcentrator Tubes/Sample Tubes</li> <li>Sample Loops</li> <li>Capillary Columns</li> <li>Mass Flow Controller</li> <li>ACAMS Dilution Flow Controller (ADFC)<sup>C1</sup></li> </ul> <u>Support Gases:</u> <ul style="list-style-type: none"> <li>Purifiers</li> <li>Leak Detectors</li> <li>Compressed Gas Regulators</li> </ul>	<u>Electrical Requirements:</u> <ul style="list-style-type: none"> <li>Critical NRT monitors equipped with UPS<sup>a</sup></li> <li>Power is provided in accordance with manufacturer specifications.</li> </ul> <u>Temperature:</u> <ul style="list-style-type: none"> <li>Use operational performance characteristics to determine if the NRT is operating within control.</li> <li>Doors to environmentally controlled NRT monitor shelter must remain closed at all times, except during personnel entry/egress.</li> <li>Condensation shall be minimized and if observed, corrective actions will be taken immediately.</li> </ul>	<ul style="list-style-type: none"> <li>Routine Calibration</li> <li>Daily Challenges</li> <li>AgF impregnated pad required for VX monitoring unless direct VX monitoring is being performed</li> <li>PCT absorbent bed-depth must be a minimum of 20 mm for VX monitoring.</li> <li><b><i>VX monitoring with MINICAMS shall have a maximum flow rate of 700<sup>C1</sup> mL/min.</i></b></li> <li>Calibration of mass flow meter</li> <li>ADFC tolerance must be within limits specified in LOP 524<sup>C1</sup></li> <li>The sample exhaust must be filtered, returned to the sampling point, or vented to appropriate engineering controls.</li> <li>Verify common stack monitors are staggered at all times for continuous monitoring.<sup>C1</sup></li> </ul>	<ul style="list-style-type: none"> <li>PCT is replaced as needed, based upon challenge performance.</li> </ul>

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**Table A.5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)**

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
Depot Area Air Monitoring System (DAAMS)	<p><u>DAAMS Operational Components:</u></p> <p><u>DAAMS Tubes:</u></p> <ul style="list-style-type: none"> <li>Size may vary depending on agent operation.</li> </ul> <p><u>Sequencers:</u></p> <ul style="list-style-type: none"> <li>Direct and control flow patterns</li> </ul> <p><u>DAAMS Manifold:</u></p> <ul style="list-style-type: none"> <li>Provides stable support system</li> <li>DDFC-DAAMS Dilution Flow Controller<sup>C1</sup></li> </ul>	<p><u>Power Requirements:</u></p> <ul style="list-style-type: none"> <li>Power is provided in accordance with manufacturer specifications.</li> <li>Critical DAAMS equipped with UPS<sup>a</sup></li> </ul> <p><u>Temperature:</u></p> <ul style="list-style-type: none"> <li>Temperature is maintained to minimize condensate formation.</li> </ul>	<ul style="list-style-type: none"> <li>The sample exhaust must be filtered, returned to the sampling point, or vented to appropriate engineering controls.</li> </ul> <p><u>Vacuum Pumps:</u></p> <ul style="list-style-type: none"> <li>Used in conjunction with a flow control device or critical orifice</li> <li>Should maintain critical ratio of inlet to outlet vacuum across the orifice</li> <li>DDFC tolerance must be within the limits specified in LOP-522<sup>C1</sup></li> </ul>	<ul style="list-style-type: none"> <li>Daily checking of flow rates, critical orifices, fittings, and ferrules</li> <li>Vacuum pump, sequencer, and sample transfer line preventive maintenance will be performed in accordance with manufacturer specifications.</li> <li>Require air, nitrogen, or other inert gas flow through tube and thermal desorption of tube for conditioning</li> </ul>

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**Table A.5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)**

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
Depot Area Air Monitoring System (DAAMS) (continued)	<p><u>DAAMS Manifold</u> (Continued):</p> <ul style="list-style-type: none"> <li>Designed to provide a directional sample flow pattern and distribute the sample flow</li> </ul> <p><u>NOx Filter:</u></p> <ul style="list-style-type: none"> <li>Chromosorb moisture detection disk</li> <li>Change out frequency is listed in EG-080, <i>Monitoring Configuration Control Plan</i>, and Attachment 22.<sup>C1</sup></li> </ul>		<p><u>Hoses:</u></p> <ul style="list-style-type: none"> <li>Used to connect sequencer sample ports to the DAAMS manifold</li> <li>Silastic tubing must not be used upstream of the DAAMS tube.</li> </ul> <p><u>Manifold:</u></p> <ul style="list-style-type: none"> <li>Fabricated from stainless steel</li> <li>Units that demonstrate detectable leaks, poor flow rates, or broken sections are repaired or replaced.</li> </ul>	
	<ul style="list-style-type: none"> <li>Vacuum</li> <li>Sequencer</li> <li>Vial Assembly</li> </ul>	<ul style="list-style-type: none"> <li>Vacuum pump and sequencer are operated in accordance with manufacturer specifications. C1</li> </ul>	<p>C1</p>	<p>Vacuum pump and sequencer are maintained in accordance with manufacturer specifications.</p>

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**Table A.5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)**

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
<b>GC Analytical Systems:</b> <ul style="list-style-type: none"> <li>• FPD</li> <li>• FID<sup>b</sup></li> <li>• <b>ECD</b></li> <li>• MSD</li> <li>• <b>XSD</b></li> <li>• ITMS</li> <li>• AED</li> </ul>	<b>Operational Components:</b> <ul style="list-style-type: none"> <li>• Sample inlet</li> <li>• Capillary column</li> <li>• Column switching system</li> <li>• Support gases</li> <li>• Integration system</li> <li>• Thermal transfer system</li> <li>• Exhaust</li> <li>• Cryofocusing</li> <li>• Roughing pump<sup>c</sup></li> </ul>	<b>Power Requirements:</b> <ul style="list-style-type: none"> <li>• Power is provided in accordance with manufacturer specifications.</li> <li>• Confirmation monitor is equipped with UPS.<sup>a</sup></li> <li>• Power board is 120 volts alternating current.</li> </ul> <b>Room Temperature:</b> Between 68° and 80°F during operational periods	<ul style="list-style-type: none"> <li>• Exhaust is vented to appropriate engineering controls if required by safety analysis.</li> <li>• Temperature, flow rate, and desorption time shall be optimized.</li> </ul>	<ul style="list-style-type: none"> <li>• Performed on an "as-needed basis" in accordance with the O&amp;M manuals</li> <li>• Roughing pump oil is exchanged to maintain vacuum efficiency.</li> </ul>
<b><u>Liquid Chromatography Analytic System:</u></b> <ul style="list-style-type: none"> <li>• <b><i>Ion Chromatograph</i></b></li> <li>• <b><i>HPLC</i></b></li> <li>• <b><i>LC/MS</i></b></li> </ul>	<ul style="list-style-type: none"> <li>• <b><i>Sample introduction system</i></b></li> <li>• <b><i>Pump</i></b></li> <li>• <b><i>Packed column</i></b></li> <li>• <b><i>Support column</i></b></li> <li>• <b><i>Support gases</i></b></li> <li>• <b><i>Integration system</i></b></li> </ul>	<b><i>Power is provided in accordance with manufacturer specifications.</i></b>	<ul style="list-style-type: none"> <li>• <b><i>Degassing of buffer system</i></b></li> <li>• <b><i>HPLC grade eluents</i></b></li> </ul>	<b><i>Performed on an as-needed basis in accordance with the O&amp;M manuals</i></b>
<b>M8A1 Monitor</b>	<ul style="list-style-type: none"> <li>• <b><i>M43A1 detector unit</i></b></li> <li>• <b><i>M42 alarm unit</i></b></li> </ul>	<b><i>Power is provided in accordance with manufacturer specifications.</i></b>	<b><i>In accordance with O&amp;M manual</i></b>	<b><i>Performed on an as-needed basis in accordance with the O&amp;M manual<sup>c1</sup></i></b>
NO <sub>x</sub> Filters	N/A	In accordance with manufacturer specifications	In accordance with manufacturer specifications	N/A

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**Table A.5-1. Description and Requirements for Monitoring and Sampling Equipment (Continued)**

Monitoring Equipment	Operational Components	Manufacturer Specifications	Minimum Operational Requirements	Preventive Maintenance
<u><b>Chemical Agent Detector Kits:</b></u> <ul style="list-style-type: none"> <li>• <b>M256</b></li> <li>• <b>M256A1</b></li> <li>• <b>M272 Water Testing Kit</b></li> </ul>	<b>12 single use sampler/detectors</b>	<b>In accordance with manufacturer specifications</b>	<b>In accordance with manufacturer specifications</b>	<b>N/A</b>
<u><b>Colorimetric Tubes</b></u>	<b>Pump and tube</b>	<b>In accordance with manufacturer specifications</b>	<b>In accordance with manufacturer specifications</b>	<b>In accordance with manufacturer specifications<sup>c1</sup></b>
AgF Pad <sup>d</sup>	Polyester pad impregnated with AgNO <sub>3</sub> and KF	N/A	<ul style="list-style-type: none"> <li>• 2 pads<sup>c1</sup> placed at distal end<sup>e,f</sup></li> <li>• Demonstrate transmission efficiency ≥ 75%</li> </ul>	Establish a change out frequency to satisfy transmission efficiency ≥ 75%.

**Notes:**

- <sup>a</sup> The uninterruptible power supply (UPS) must have brown-out protection and constant voltage output and must operate the instruments for at least 15 minutes during a power failure.
- <sup>b</sup> The flame ionization detector (FID) inlet has split/splitless injection port with an autosampler.
- <sup>c</sup> Mass selective detector (MSD) only
- <sup>d</sup> AgF conversion pads cause false negative effects on GA and HD detection. Laboratories/monitoring group shall develop procedures to ensure that multiple agent monitoring for VX, HD, and GA is conducted in such a manner as not to bias GA/HD detection. If detection methods are certified to detect VX as VX, then an AgF conversion pad is not required.
- <sup>e</sup> The distal end is the point at which the sample enters the sample line or sample probe.
- <sup>f</sup> The VX pad can be recessed from the distal end at the MPF discharge airlock and DAAMS duct monitoring locations.

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**Table A.5-2. Support Gases Equipment Requirements<sup>a</sup>**

Support Gases	Purifiers	Leak Detectors	Compressed Gas Regulators	Compressed Gas Line
<p><u>May include:</u></p> <ul style="list-style-type: none"> <li>Hydrogen</li> <li>Air</li> <li>Nitrogen</li> <li>Helium</li> <li>Toxic gas mixtures</li> </ul> <p>Cryofocusing requires liquid nitrogen or carbon dioxide.</p> <p>Support gases are handled and stored in accordance with the Site Chemical Hygiene Plan, which incorporates:</p> <ul style="list-style-type: none"> <li>The CGA Pamphlet P-1; AR 700-68</li> <li>CGA Pamphlet S-1.1-1963 and 1965 addendum and S-1.2-1963</li> <li>29 CFR 1910.101</li> </ul>	<p><u>Moisture and Hydrocarbon Traps(if recommended by manufacturer or vendor):</u></p> <p>Frequency of change outs are:</p> <ul style="list-style-type: none"> <li>Annually</li> <li>Based on instrumentation performance</li> </ul>	<p><u>May include:</u></p> <ul style="list-style-type: none"> <li>Simple soap solution</li> <li>Electronic leak detector</li> </ul> <p><u>Utilization:</u></p> <ul style="list-style-type: none"> <li>Completed in accordance with manufacturer specifications and requirements</li> </ul>	<ul style="list-style-type: none"> <li>Will be two-stage regulators or equivalent</li> <li>Use of toxic chemical approved regulators for gas containing PS, CK, CG, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Will be pre-cleaned tubing</li> <li>All fittings will be Swagelok® fittings or equivalent.</li> </ul>

Note:

<sup>a</sup> Gas generators will be operated in accordance with manufacturer specifications.

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**6. MONITORING DOCUMENTATION REQUIREMENTS**

Table A.6-1 lists TOCDF Plans most commonly used by the laboratory. Tables A.6-2 through A.6-4 provide general monitoring documentation requirements. Documentation requirements for laboratory/monitoring group quality assurance (QA) are presented in the TOCDF LQCP. Additional requirements may be included in the site Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) or RCRA permits and other site-specific documents.

The requirements of this TOCDF MCP will be used to aid in conjunction with Attachment 22,<sup>C1</sup> TOCDF Agent Monitoring Plan (AMP), which shall address, as a minimum:

- Diagram of the operational site or storage facility
- A list of the agent and munitions involved
- Detailed list and description of monitoring systems to be used
- Diagram and list of monitoring locations
- Description of sample lines
- Emergency response
- Monitoring cessation or reduction
- Monitoring continuation.

Additionally, the AMP shall include a table identifying the monitoring location (monitor and sampling point), monitoring level, length of sample line, monitoring frequency, type of monitoring (NRT, Depot Area Air Monitoring System (DAAMS), etc.), and any specific comments (that is, spooled lines, dilution control device, sample sequencer, etc.) that will aid in understanding the monitoring system.

In addition to the AMP, TOCDF has other applicable documentation listed in Table A.6-1.

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**Table A.6-1. Required Plans**

Required Monitoring Documentation	Content
TOCDF Site Safety Plan	Specified in Section 126 of the Superfund Amendments and Reauthorization Act (SARA) 1986 and required by the National Contingency Plan To address: <ul style="list-style-type: none"> <li>• Health and safety hazards of site operation</li> <li>• Requirements and procedures for employee protection</li> <li>• Maintenance and calibration methods of monitoring and sampling equipment</li> <li>• Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used.</li> </ul>
TOCDF Agent Monitoring Plan, Attachment 22 of the RCRA Permit	Specified in DA Pam 385-61
TOCDF Waste Analysis Plan, Attachment 2 of the RCRA Permit	Specified in 40 CFR 264.13
TOCDF Chemical Hygiene Plan	Specified in 29 CFR 1910.120, 29 CFR 1910.1200, and 29 CFR 1910.1450
TOCDF Information Management Plan	Compliance with requirements identified in public laws, policies, and regulations of various regulatory agencies

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**Table A.6-2. Monitoring Documentation Requirements – Confirmed Chemical Materiel**

If chemical materiel is detected in unexpected areas during site operations, results will be reported to the CON in accordance with LQCP Section 17.8. The following information will be gathered by Laboratory Management and will be available upon request:

- Identification of the chemical materiel
- Sample ID Number\Sample Station
- Found concentration, in mg/m<sup>3</sup>
- Associated NRT reading (if applicable)
- Date, time, and location of reading or measurement
- QC sample results supporting the analytical results
- Statement on the quality of monitoring data and printouts of the actual data
- Any chemical materiel readings at any relevant stations at the site, destruction facility, or storage facility
- Description of site operations during the sample aspiration period
- A statement of the potential chemical compound's source
- Explanation of response or operator comments
- Name/unique ID number of operator collecting and analyzing the sample
- Analytical method used for analysis
- Analytical instrument ID.

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**Table A.6-3. NRT Monitor Alarm Report<sup>a</sup>**

Unconfirmed Alarms	Malfunction Alarms
<p>For each unconfirmed alarm:</p> <ul style="list-style-type: none"> <li>• Site</li> <li>• Chemical</li> <li>• Monitoring level</li> <li>• Station number</li> <li>• Date and time</li> <li>• Duration and value</li> <li>• Minimum and maximum value</li> <li>• Time alarm cleared</li> <li>• Confirmation method and associated QP recoveries.</li> </ul> <p>Summary for reporting period:</p> <ul style="list-style-type: none"> <li>• Total unconfirmed alarms per station.</li> </ul>	<p>For each malfunction alarm:</p> <ul style="list-style-type: none"> <li>• Site</li> <li>• Chemical</li> <li>• Monitoring level</li> <li>• Station number</li> <li>• Date and time</li> <li>• Duration and value</li> <li>• Time malfunction cleared.</li> </ul> <p>Summary for reporting period:</p> <ul style="list-style-type: none"> <li>• Total malfunction alarms per station</li> <li>• Mean time between malfunctions.</li> </ul>

Notes:

<sup>a</sup> Reports will be submitted to CMA-Monitoring Office monthly.

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**Table A.6-4. Monitoring Documentation Requirements – Sample Analysis Report**

- Title
- Project name and site address
- Unique ID of the report
- Report recipient name and address
- Description of each sample analyzed
- Characterization and condition of sample
- Date of sample collection and analysis
- Identification of or reference to the analytical method used
- Identification of or reference to the sampling method used
- Identification of deviations from approved methods and other information relevant to the sample
- Analytical results supported by tables, charts, sketches, or photos
- Statement on control status of corresponding QL and QP recoveries and other appropriate QC samples for the sample collection period
- Signature and title of persons accepting responsibility for report contents
- Results identified as performed by outside laboratories or vendors
- Statement on chain of custody adherence.

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**7. PROCEDURES FOR REPORTING POSITIVE CHEMICAL MATERIEL RESPONSES**

**7.1. Introduction**

Due to the low monitoring levels required during TOCDF operations and the potential for false positive readings, the laboratory/monitoring group will follow a strict protocol for reporting any chemical materiel response at or above the alarm set point for NRT or reportable limit for historical methods. When reporting the detection of chemical materiel, the value recorded for the primary monitoring method (quantitative method) shall be the reported value. For NRT alarms the ACAMS value will be reported as the primary monitor and for positive historical samples only samples analyzed on fully quantitative Class I methods will be reported as the primary monitor. For more information see LQCP Section 16.7. The calculated RL for NRT confirmation samples will be based the total number of ACAMS cycles in alarm above the NRT alarm set point.

**7.2. Alarm Set Points/Reportable Limits**

For non-process area air monitoring purposes, TOCDF alarm set points/reportable limits will be set to a conservative level to ensure detection in the event chemical materiel is present at the monitoring level. See Attachment 22, for specific details.<sup>C1</sup> The maximum alarm set point/reportable limit values will be established using a statistical response rate of 95 percent at the alarm level as determined by continuing baseline studies. Once an alarm or response above the reportable limit is encountered, corrective actions shall be implemented. All chemical materiel alarms shall be considered real until corrective actions indicate otherwise (that is, confirmation, verification of process controls, etc.). Alarm set points for process area monitors will be set based on PPE requirements.

All alarm set points will be documented in the TOCDF Agent Monitoring Plan.

**7.3. NRT-Only Station Alarm Response**

Figure 7-1 provides the response concept for NRT-only stations.

**7.4. NRT Stations Coupled with Confirmation Stations**

Figure 7-2 provides the response concept for NRT stations coupled with confirmation stations.

**7.5. Historical-Only Stations**

Figure 7-3 provides the response concepts for historical-only stations.

**7.6. Low-Level NRT Monitoring Data Tracking**

Low level trending of ACAMS data will be performed at TOCDF by reviewing electronic monitoring data for non-toxic areas. A trend is

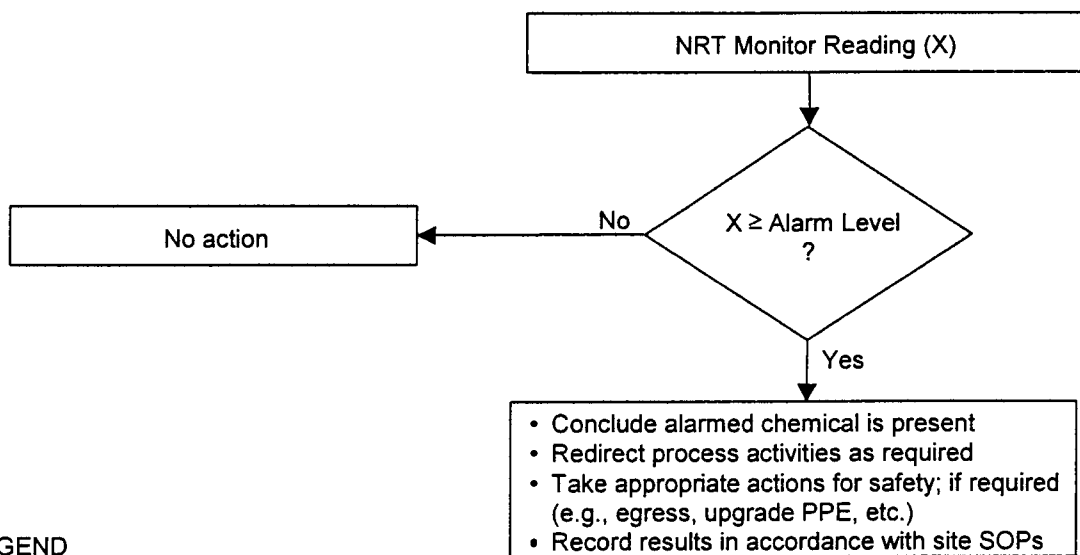
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defined as seven consecutive sub alarm level cycles with an agent reading above 0.1 STEL. Trends meeting this criterion will be documented and reported to TOCDF Laboratory Management and the TOCDF Safety department.<sup>C1</sup> Additionally TOCDF will perform low level tracking of DAAMS results. For more information see LQCP Section 16.7.

**7.7. Laboratory Screening of Waste Streams**

Liquid and solid samples will be collected in accordance with TE-LOP-534 and Analyzed in accordance with TE-LOP-572. TOCDF waste screening samples do not require confirmatory analysis. The response concept for laboratory waste and process samples is illustrated in figures 7-4 and 7-5.

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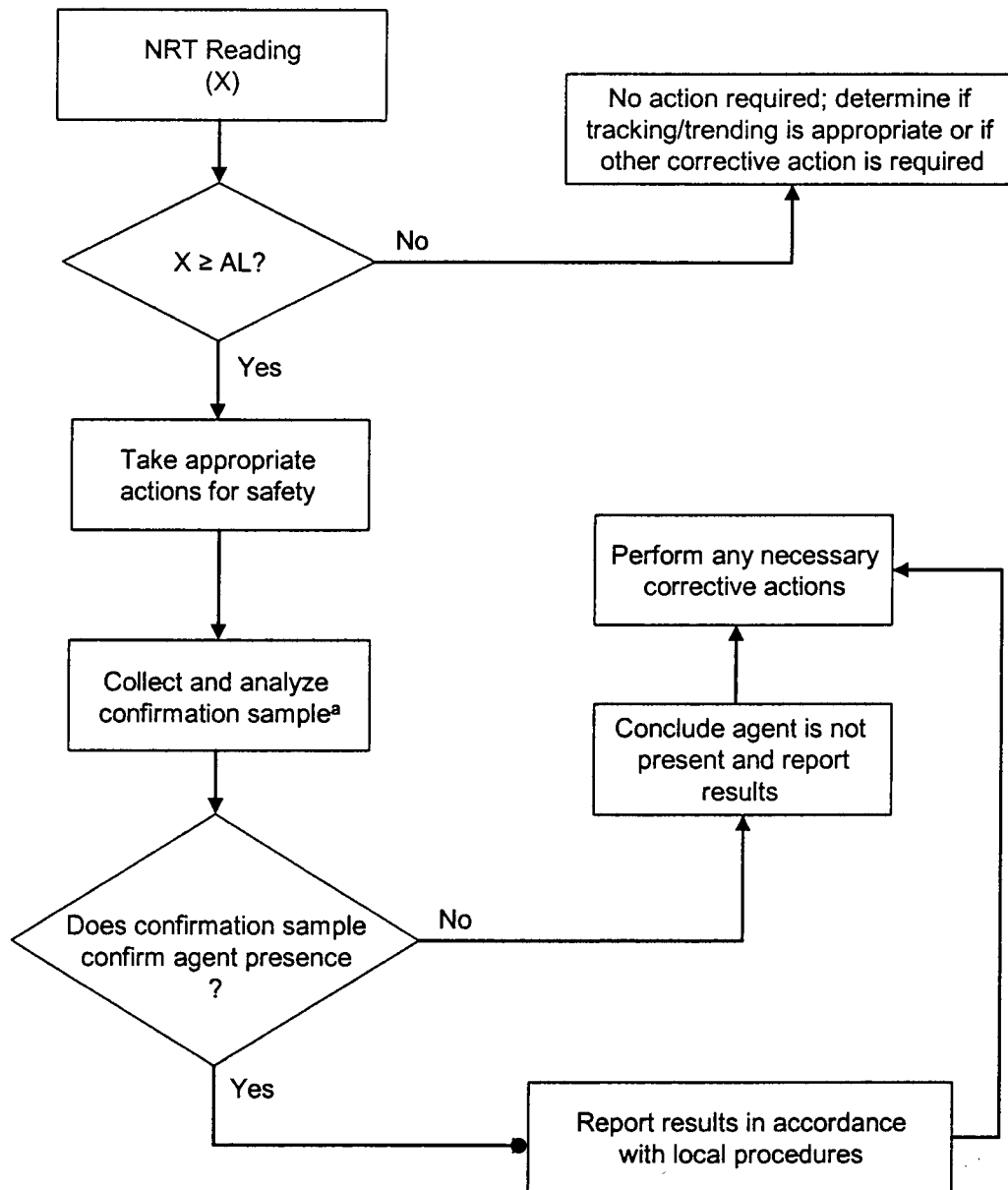
**LEGEND**

NRT = near real-time  
 PPE = personal protective equipment  
 SOP = Standing Operating Procedure  
 X = a number > 0

T-023-013/80w1a.ppt  
 1/21/04

**Figure 7-1. Response Concept for NRT-Only Station Alarms**

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T-023-013/figure 7-2(NRT-Confirmation Concept)[1].ppt  
5/10/04

**LEGEND**

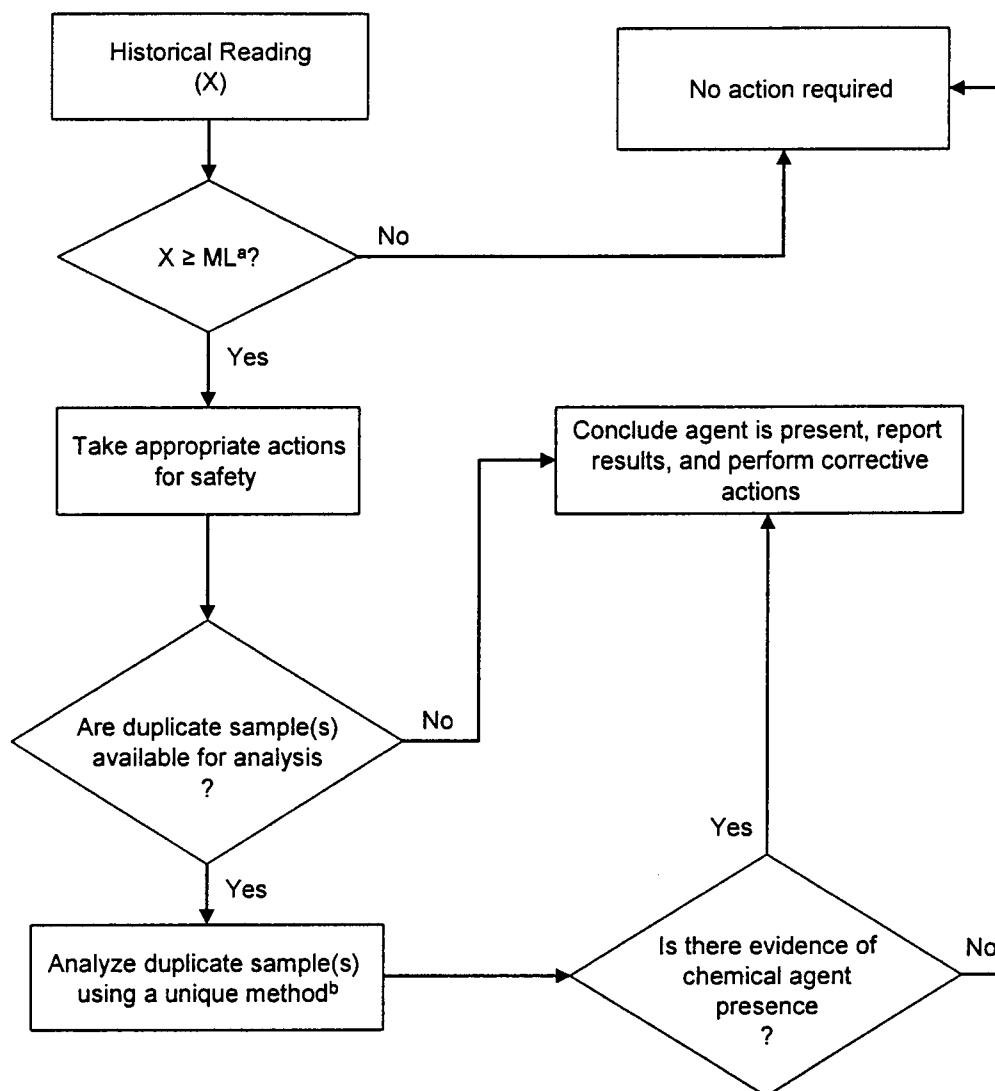
AL = alarm level  
NRT = near real-time  
X = any number > 0

**Note:**

- <sup>a</sup> Confirmation requires analysis on a column of differing polarity or an instrument with a different detection principle and shall have sufficient sensitivity to determine agent concentration at the monitoring level.

**Figure 7-2. Response Concept for NRT Monitors Coupled with Confirmation Stations**

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T-023-013/figure 7-3(Historical Only Concept)(1).ppt  
4/29/04

**LEGEND**

ML = monitoring level

X = any number > 0

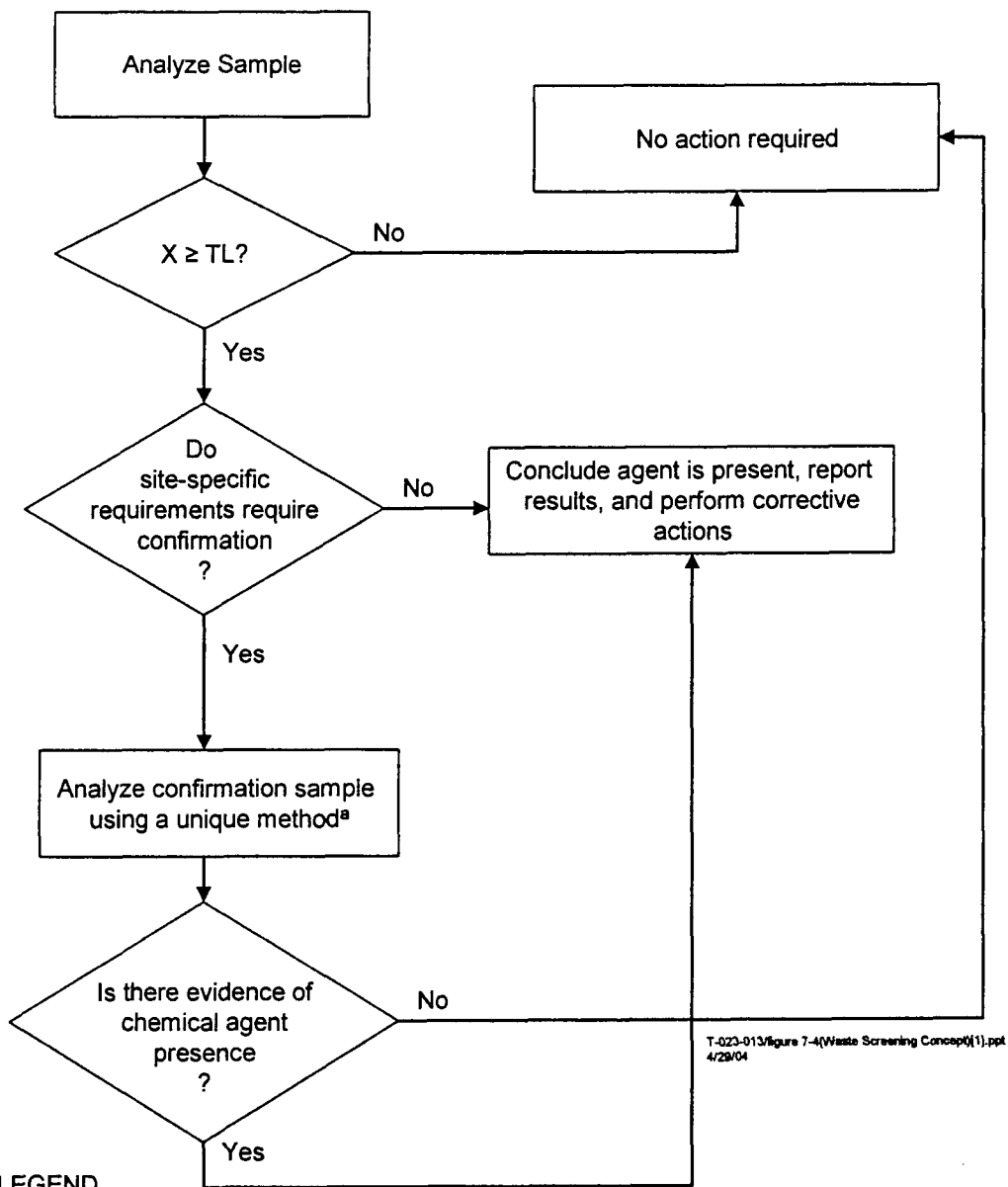
**Notes:**

<sup>a</sup> Monitoring Level or Reportable Limit

<sup>b</sup> A unique method may include analysis on a column of differing polarity or an instrument with a different detection principle and shall have sufficient sensitivity to determine agent concentration at the monitoring level.

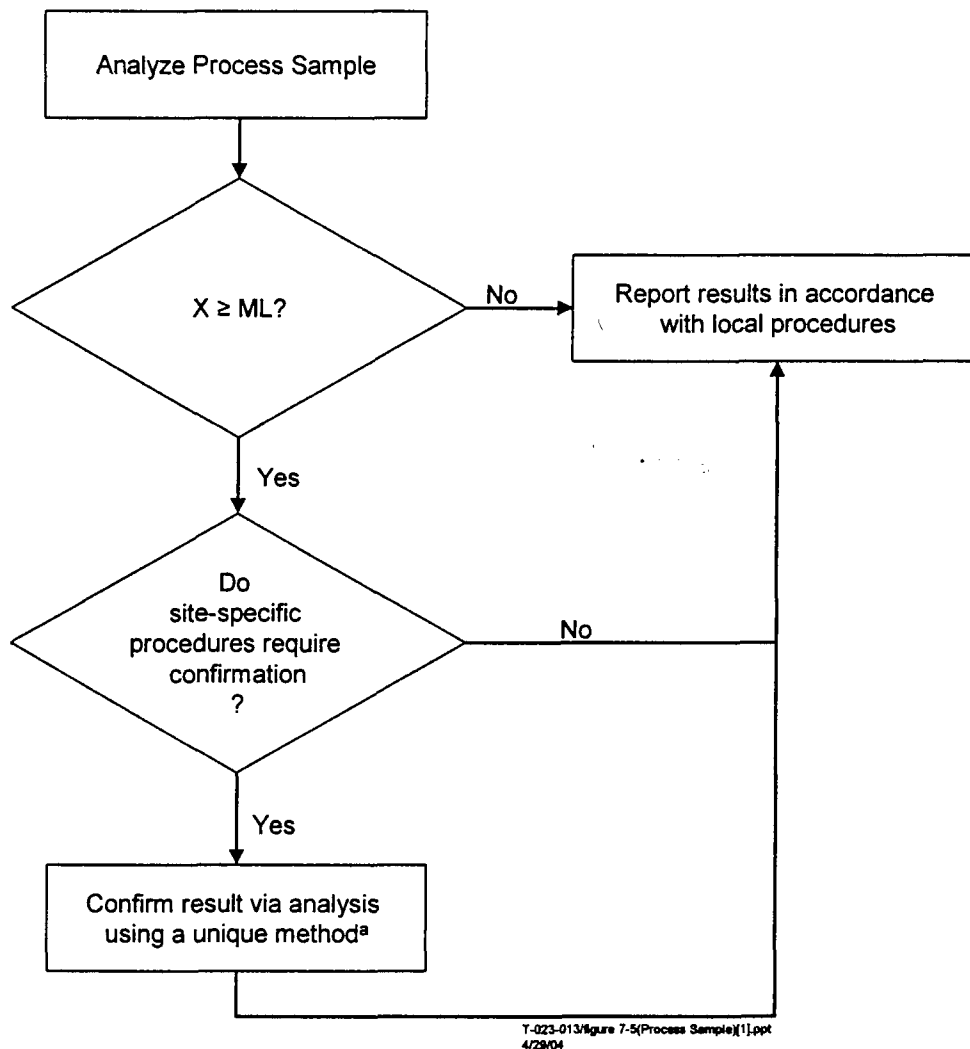
**Figure 7-3. Response Concept for Historical-Only Stations**

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**Figure 7-4. Response Concept for Waste Screening**

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**LEGEND**

ML = monitoring level  
X = any number > 0

Note:

- A unique method may include analysis on a column of differing polarity or an instrument with a different detection principle with sufficient sensitivity to determine agent concentration at the monitoring level.

**Figure 7-5. Response Concept for Process Sample Response**

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**7.8. Minimization of False Positive/Negative Responses**

Testing to determine potential false positives/negatives will be performed in accordance with PRP-MO-002. DAAMS tubes will be analyzed in accordance with TE-LOP-562. The CMA Interference Database (AIDE) may be used to help identify possible interferences. All chemicals entering the facility are required to be tested for their potential to initiate a false alarm. Results should be reported to the AIDE website. When false alarms are encountered, corrective actions shall be initiated and effort should be made to identify the source and mitigate future false alarm responses. When applicable, the corrective action may result in the development of a new analytical method.

**8. LIMITING CONDITIONS OF OPERATION (LCOs)**

**8.1. Introduction**

All TOCDF operations are governed by LCOs or similar operational requirements. The following paragraphs present recommended minimum LCOs for laboratory/monitoring group activities at TOCDF. Actual LCOs for the laboratory/monitoring groups are located in TOCDF CDRL 21, Limiting Conditions of Operations.

**8.2. Analytical Systems**

LCOs for analytical systems include requirements for personnel, calibration and quality assurance/quality control (QA/QC), the TOCDF<sup>C1</sup> laboratory/monitoring group, and instrumentation. Recommended LCOs are presented in Table A.8-1.

**8.3. Monitoring and Sampling Systems**

Recommended LCOs governing personnel, calibration and QA/QC, and instrumentation for monitoring and sampling systems are identified in Table A.8-2.

**8.4. Confirmation Monitoring**

Confirmation samples shall have priority over routine samples.

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**Table A.8-1. Recommended Laboratory LCOs**

Personnel <sup>a</sup>	Calibration and QA/QC	CMA Laboratory Facility	Instrumentation <sup>a</sup>
<ul style="list-style-type: none"> <li>• Sufficient Certified GC Operators</li> <li>• Sufficient Certified Laboratory Technicians and Data Management Personnel</li> <li>• Sufficient Certified Laboratory Management/Designee Present</li> </ul>	<ul style="list-style-type: none"> <li>• Calibration and Challenge Standards Current</li> <li>• Operational<sup>b</sup> Instruments Calibrated and in Control</li> </ul>	<ul style="list-style-type: none"> <li>• Ventilation System (Fume Hoods) Operational</li> <li>• HVAC in Operational Limits (68° to 80°F)</li> <li>• Electrical Power Operational</li> <li>• Eye Washes and Safety Showers Operational</li> <li>• Communications Operational<sup>d</sup></li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient Number of Analytical Instruments Operational</li> <li>• Sufficient Support Equipment Operational<sup>c</sup></li> </ul>

**Notes:**

- <sup>a</sup> Sufficient numbers of personnel and equipment are determined by the CMA laboratory based on operational experience.
- <sup>b</sup> Operational instruments are those that are in the field, online, and are necessary to support daily operations.
- <sup>c</sup> Support equipment includes vacuum pumps, pH meter, etc.
- <sup>d</sup> Communications can be in the form of telephone or radio communications.

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**Table A.8-2. Recommended Monitoring LCOs**

Personnel <sup>a</sup>	Calibration and QA/QC	Instrumentation <sup>a</sup>
<ul style="list-style-type: none"> <li>• Sufficient Certified monitoring Technicians</li> <li>• Sufficient Certified Laboratory/Monitoring Group Management/Designee Present</li> </ul>	<ul style="list-style-type: none"> <li>• Agent Calibration and Challenge Standards Current</li> <li>• Operational<sup>b</sup> Instruments Calibrated and in Control</li> <li>• Operational<sup>b</sup> Method in Control (QPs)</li> </ul>	<ul style="list-style-type: none"> <li>• Sufficient Currently Approved NRT Monitors are Operational</li> <li>• All Designated NRT Monitoring Locations have Equipment</li> <li>• Sufficient Support Equipment Operational<sup>c</sup></li> <li>• Sufficient Historical and Confirmation Sampling Equipment Operational</li> </ul>

**Notes:**

- <sup>a</sup> Sufficient numbers of personnel and equipment will be determined by the laboratory/monitoring group based on operational experience.
- <sup>b</sup> Operational instruments are those that are in the field, online, and are necessary to support daily operations.
- <sup>c</sup> Support equipment includes vacuum pumps, sample probes, dilution systems, etc.

## **CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)**

### **APPENDIX B – REFERENCES**

#### **APPENDIX B - REFERENCES**

1. **CDRL 11** – Laboratory Operating Plan
2. **CDRL 18 (E002)** – TOCDF Personnel Training Plan
3. **CDRL 20** – Occupational Health and Hygiene Plan
4. **CDRL 20, Appendix A** – Laboratory Chemical Hygiene Plan
5. **CDRL 21** – Limiting Conditions of Operations
6. **EG 016** – Equipment Calibration Plan
7. **EG 033** – C EMS Certification Quality Assurance Program Plan
8. **EG 080** – Monitoring Configuration Control Plan
9. **GDL-LA-001** – Conducting Laboratory Management Reviews.
10. **GDL-LA-002** – Laboratory Data Handling
11. **PRP-DC-001** – Procedure or Plan Revision Change or Deletion
12. **PRP-DC-004** – Processing and Distribution of Reference Documents and Submittal and Storage of Records
13. **PRP-DC-008** – Distribution and Control of Documents
14. **PRP-EN-030** – Site Contractor's Lessons Learned
15. **PRP-LA-002** – Analytical Safety Requirements
16. **PRP-LA-007** – CAL Records
17. **PRP-MG-002** – Control of PMCD Directed Actions
18. **PRP-MG-012** – Critique Process
19. **PRP-MG-014** – Event Investigation
20. **PRP-MG-015** – Planning, Scheduling, Implementation and Documentation of Work Activities
21. **PRP-MO-002** – ACAMS and DAAMS Interferent Testing
22. **PRP-QA-003** – Quality Management Supplier Evaluation and Assessment
23. **PRP-QA-014** – Control of Nonconformances
24. **PRP-SA-052** – Toxic Area Entry Requirements
25. **RCRA Permit Attachment 2** – Waste Analysis Plan
26. **RCRA Permit Attachment 22** – Agent Monitoring Plan (AMP)
27. **TE-LOP-532** – Decontamination Certification
28. **TE-LOP-534** – Liquid and Dry Solid Residue Sampling
29. **TE-LOP-553** – General Laboratory Requirements

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- 30. **TE-LOP-562** – Analysis of Depot Area Air Monitoring System (DAAMS) Tubes
- 31. **TE-LOP-567** – GC-MSD – FPD Operations
- 32. **TE-LOP-572** – Extractions/Analyses
- 33. **TE-LOP-584** – Neat Agent Operations
- 34. **TE-LOP-592** – QC Procedures for Monitoring Operations
- 35. **TE-LOP-594** – QC Procedures for Analytical Operations

**CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)**  
**APPENDIX C – DEFINITIONS**

**APPENDIX C - DEFINITIONS**

1. **ACCURACY** – The agreement of a measurement with an accepted reference of true value. Accuracy is usually expressed in terms of percent recovery.
2. **AIRBORNE EXPOSURE LIMITS** – Allowable concentrations in the air for occupational and general population exposures.
3. **ANALYTE** – The substance to be detected and/or measured when performing the chemical analysis of a sample.
4. **ASSIGNABLE CAUSE** – Assignable cause is defined as a known reason for the occurrence, usually determined to be operator or systematic error that does not correctly indicate the performance of the instrument or monitoring system.
5. **AUDIT** – A planned and documented investigative evaluation of an item or process to determine its adequacy, effectiveness, and compliance with established procedures, instructions, drawings, quality control (QC) plans, and/or other applicable documents.
6. **CALIBRATION** – The process of determining response factors used to calculate absolute concentrations by injecting specially prepared calibration samples. Establishing a relationship between known concentrations of analyte and the detector response.
7. **CASARM** – Chemical Agent Standard Analytical Reference Material (CASARM) is a high purity certified chemical agent standard used by the U.S. Army Chemical Materials Agency (CMA) laboratory/monitoring group to prepare stock agent solutions and subsequent working standards.
8. **CEILING VALUE** – The maximum exposure concentration at any time, for any duration. Practically, it may be an average value over the minimum time required to detect the specified concentration.
9. **CHAIN OF CUSTODY (COC)** – An unbroken trail of accountability that ensures the physical security of samples, data, and records.
10. **CHALLENGE** – An injection of a known standard at a required monitoring level to validate that the instrument is still in control and that the calibration is valid.
11. **CHEMICAL WARFARE MATERIEL (CWM)** – Equipment, munitions, devices, and containers designed for use directly in connection with the employment of chemical weapons or containerization of chemical agents or industrial chemicals. This term includes the chemical weapons stockpile; chemical weapons production facilities; binary weapons and components; buried, range recovered, or found chemical munitions, containers, or chemical agent identification sets (CAIS).

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**APPENDIX C – DEFINITIONS**

12. **COLORIMETRIC TUBES** – Small glass tubes filled with solid adsorbents, such as silica gel, activated alumina, or inert granules, and impregnated with detecting chemicals through which air is aspirated at a controlled rate. The detector chemical undergoes a color change in the presence of the contaminant; the contaminant concentration is proportional to the intensity of color change or the length of the stain within the colorimetric tube.
13. **CONFIDENCE (OR SIGNIFICANCE) LEVEL** – A value corresponding to the probability that a single future measurement will yield a particular result or fall within a particular interval of values.
14. **CONTINUING CALIBRATION VERIFICATION (CCV)** – A quality laboratory (QL) sample analyzed at prescribed intervals throughout the entire analytical run and used to verify the continued accuracy of the instrument calibration and to monitor instrument drift and overall instrument performance.
15. **CORRECTIVE ACTION** – Any action taken to rectify adverse conditions, and where possible, to preclude their recurrence.
16. **DATA VALIDATION** – An analyte- and sample-specific process that extends the evaluation of data beyond method, procedural, or contractual compliance (that is, data verification) to determine the analytical quality of a specific data set as specified in Guidance on *Environmental Data Verification and Data Validation*, USEPA QA/G-8, November 2002.
17. **DEMILITARIZATION** – The mutilation, destruction, or neutralization of chemical materiel, rendering it harmless and ineffectual for military purposes.
18. **DIAGNOSTIC QUALITY PLANT (QP) CHALLENGE** – QP challenges performed, as part of corrective actions to determine if a problem has been resolved and are not included in the baseline calculations.
19. **DILUTE RESEARCH DEVELOPMENT, TEST, AND EVALUATION (RDT&E) STANDARDS** – Solutions in concentrations and quantities not exceeding the levels defined in Army Regulation 50-6, Chapter 6, *Research Chemical Agents*.
20. **DOUBLE BLIND QL** – Spiked sample prepared by QC personnel that is placed with the analytical sequence at a location unknown to the analyst. This process ensures that the analyst does not know the location or the spike level during analysis.
21. **DUPLICATE SAMPLES** – Also known as replicate samples or split samples, duplicate samples are two aliquots taken from the same sample container and analyzed separately to test repeatability of an analysis.
22. **FOUND CONCENTRATION (FC)** – Concentration of a standard analyte solution measured by a sampling and analysis method after a challenge with a known standard concentration (target concentration [TC]).
23. **GENERAL POPULATION LIMIT (GPL)** – The allowable 72-hour time-weighted average concentration for the general population. The limit applies to the entire <sup>C1</sup> population, including all ages and medical conditions.

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**APPENDIX C – DEFINITIONS**

24. **HOLDING TIME** – The maximum time allowable between sample collection and/or extraction and analysis. Some samples may have a time limit to be analyzed/extracted from the start time when the sample was collected. Some samples may have a time limit to be analyzed once they have been extracted.
25. **IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH):**
- 25.1. A condition posing an immediate threat to life or health, or an immediate threat of severe exposure to contaminants likely to have adverse delayed effects on health. This condition includes atmospheres where oxygen content by volume is less than 19.5 percent.
  - 25.2. The maximum concentration from which, in the event of a respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing (for example, severe eye irritation) or irreversible health effects.
  - 25.3. IDLH levels have not been established for vesicants because workers are required to wear supplied air or self-contained breathing apparatus at vesicant concentrations much lower than IDLH levels. IDLH levels for industrial chemicals that may be encountered during non-stockpile operations are adopted from the National Institute for Occupational Safety and Health (NIOSH).
26. **INDUSTRIAL COMPOUNDS** – Chemicals developed or manufactured for use in industrial operations or research; these chemicals are not primarily manufactured for the specific purpose of producing human casualties or rendering equipment, facilities, or areas dangerous for use by man.
27. **INITIAL CALIBRATION VERIFICATION (ICV)** – A QL sample that is analyzed immediately following instrument calibration and is used to verify the accuracy of the instrument calibration and to monitor instrument drift and overall instrument performance.
28. **LABORATORY/MONITORING GROUP** – Person or person(s) responsible for performing all environmental, analytical, and safety laboratory/monitoring activities at a given site. This group has the responsibility to collect, analyze, and document samples, preserve samples, prepare samples for offsite transportation, calibrate and challenge monitoring instruments, review sample analysis results, and report sample analysis results from laboratory/monitoring instruments to the Site Project Officer.
29. **LABORATORY QUALITY CONTROL PLAN** – A quality assurance/quality control (QA/QC) plan developed to implement the requirements of the Laboratory Monitoring and Quality Assurance Plan (LMQAP) in support of CMA laboratory and monitoring activities for each site, project, or operation.
30. **MATRIX** – The component or substrate that contains the analyte of interest.
31. **MATRIX SPIKE SAMPLE (MSS)** – A sample that is spiked with the appropriate analyte prior to sample preparation and analysis.

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**APPENDIX C – DEFINITIONS**

32. **MATRIX SPIKE SAMPLE DUPLICATE (MSSD)** – A second spiked sample that is spiked with the appropriate analyte prior to sample preparation and analysis.
33. **METHOD** – A set of procedures and techniques for systematically performing an activity (for example, sampling, chemical analysis, quantification). A method will encompass certain parameters that, when changed significantly, may result in a new method. Methods shall be placed under configuration control and critical parameters shall identify tolerances that, when exceeded, will result in a “new” method.
34. **METHOD BIAS** – A systematic error inherent in a method or caused by some artifact or idiosyncrasy of the measurement system. Examples are temperature effects, extraction inefficiencies, contamination, mechanical losses, and calibration errors. Bias may be both positive and negative, and several types can exist concurrently so that net bias is all that can be evaluated, except under special conditions.
35. **METHOD BLANK** – Analyte-free water or soil, processed in the exact manner as the samples within a batch, using identical reagents and solvents.
36. **METHOD DETECTION LIMIT (MDL)** – The MDL refers to waste methods only. The minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyzed concentration is greater than zero and is determined from analysis of a sample in a given waste matrix containing the analyte. The MDL is the lowest level at which an analyte may be reported using that method (source is 40 CFR, Part 136, Appendix B)
37. **METHOD OR MEASUREMENT ACCURACY** – The degree of agreement of a measured value with the true or expected value of the quantity of concern. Method accuracy depends on the lack of bias and imprecision of the method.
38. **MOBILE STATION** – A mobile station is comprised of near real-time (NRT) instruments and sampling points that change location in accordance with operational requirements to include real-time analytical platforms (RTAPs) and first entry monitoring.
39. **MONITORING** – The continued or periodic act of seeking to determine whether a chemical agent is present (Department of the Army [DA] Pamphlet [Pam] 385-61).
40. **MONITORING LEVEL** – The level to which monitoring is performed. Responses at or above the monitoring level indicate the monitoring level has been met or exceeded and corrective actions are required. For waste screening purposes, the monitoring level is the negotiated treatment value for a specific analyte within a specific matrix.
41. **MONITORING PLAN** – A detailed, site-specific plan that covers all laboratory and monitoring objectives and strategies for a given site. The plan describes methods and equipment used, locations, number and type of samples, safety requirements, transportation and shipping instructions, scheduling, and any other site-related monitoring requirements.

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- 42. **NEAR REAL-TIME (NRT) CONFIRMATION** – Confirmation of the detection of agent at the required monitoring levels in the event of an NRT monitor chemical agent alarm.
- 43. **NEAT CHEMICAL AGENT** – An undiluted, full-strength (as manufactured) chemical agent or agent at concentrations above RDT&E dilute level. Chemical agent manufactured by the binary synthesis route will also be considered a neat agent, regardless of purity.
- 44. **NRT MONITOR** – A monitor that has the capability to automatically collect a sample, analyze the sample, and report/display the sample analysis results within 15 minutes or less.
- 45. **PERMISSIBLE or PUBLISHED EXPOSURE LIMIT (PEL)** – The exposure inhalation or dermal PEL specified in 29 CFR Part 1910, Subparts G and Z.
- 46. **pH** – A measure for the activity of the hydrogen ions in a substance. The hydrogen ion activity determines the acidic, neutral, or alkaline character of a substance.
- 47. **PRACTICAL QUANTITATION LIMIT (PQL)** – The lowest concentration that can be reliably determined with specified limits of precision and accuracy for a given analytical method. The PQL is 10 times the method detection limit (MDL) as defined by USEPA SW-846. The PQL is applied to waste screening methods.
- 48. **PRECISION** – A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, generally expressed in terms of the standard deviation.
- 49. **PROFICIENCY TESTING PROGRAM (PTP)** – This program plan specifies the program requirements adopted by the CASARM Quality Assurance Team (CQAT) for conducting a PTP for chemical agent monitoring. The PTP describes actions and activities required to operate an effective proficiency test plan to support the Army's CASARM Quality Assurance Program. The PTP may be used to check the consistency and comparability of data for individual testing personnel, establish the effectiveness and comparability of test methods, achieve systemic improvement, and assist with the determination of reasons for inter-laboratory differences.
- 50. **PUBLISHED EXPOSURE LEVEL** – The exposure limits published in *NIOSH Pocket Guide to Chemical Hazards*, dated 1994, incorporated by reference, or if none are specified, the exposure limits published in the standards specified by the American Conference of Governmental Industrial Hygienists in their publication, *Threshold Limit Values and Biological Exposure Indices*, dated 1994, incorporated by reference.
- 51. **QUALITY** – The totality of features and characteristics of a product or service that bear on its ability to meet the stated or implied needs and expectations of the user.
- 52. **QUALITY ASSURANCE (QA)** – An integrated system of management activities involving planning, implementation, assessment, reporting, and quality

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improvement to ensure that a process, item, or service is of the type and quality needed and expected by the customer.

- 53. **QUALITY CONTROL (QC)** – The overall system of technical activities that measure the attributes and performance of a process, item, or service against defined standards to verify that it meets the stated requirements established by the customer.
- 54. **QUALITY LABORATORY (QL) SAMPLE** – A sample media that has been spiked with a solution of dilute chemical standard analytical reference material (SARM). The exact amount of SARM is recorded and documented with the sample identification. The purpose of the sample is to verify the in-control status of the laboratory instrument.
- 55. **QUALITY PLANT (QP) SAMPLE** – A sample media that has been spiked with a solution of dilute chemical agent<sup>C1</sup> prior to being placed in the field or following aspiration of the blank tube in the field. The sample is spiked and then carried out to the sample collection point and exposed to the sample collection point atmosphere. The exact amount of agent<sup>C1</sup> is recorded and documented with the sample identification (target concentration). Upon analysis in the laboratory, the QP's found mass must be within an acceptable tolerance. The purpose of the sample is to identify sources of sample contamination or sample degradation in the field at the sample collection location.
- 56. **RANDOM ERROR** – A component of total error that is not assignable to appropriate specific source and the magnitude of which can be predicted only in terms of probability.
- 57. **REPORTABLE LIMIT (RL)** – A predetermined value for historical method, that when equaled or exceeded will be reported as chemical material that may have exceeded the monitoring level.
- 58. **SAMPLING PLAN** – A detailed, site-specific plan that covers all sampling objectives and strategies for a given site. The plan describes methods and equipment used, locations, number and type of samples, safety requirements, transportation and shipping instructions, scheduling, and any other site-related sampling requirements.
- 59. **SHORT-TERM EXPOSURE LIMIT (STEL)** – The average concentration to which unprotected chemical workers may be exposed for up to 15 minutes continuously.
- 60. **SOLID WASTE** – Discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities, but does not include solid or dissolved materials in irrigation return flows or industrial discharges that are point sources subject to permits under Section 402 of the Federal Water Pollution Control Act, as amended.
- 61. **SOURCE EMISSION LIMIT (SEL)** – The SEL replaces the previously used allowable stack concentration (ASC) and is a non-regulatory ceiling value that serves as a source emission limit and not as a health standard. It is used for

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monitoring the furnace ducts and common stack. SEL values are identified in the Attachment 22, Agent Monitoring Plan.<sup>C1</sup>

- 62. **SPIKED QC SAMPLE** – A separate aliquot of a sample that is spiked with a known and documented amount of reference material to check for matrix or sampling effects on percent recovery.
- 63. **STANDARD** – A known concentration of a known chemical that is used to perform quantitative analysis.
- 64. **STANDARD OPERATING PROCEDURE (SOP)** – A written document that details the method for an operation, analysis, or action with thoroughly prescribed techniques and steps, and that is officially approved as the method for performing certain routine or repetitive tasks.
- 65. **TARGET ACTION LEVEL (TAL)** – The highest target or true analyte concentration that can be distinguished as lower than the monitoring level 97.5 percent of the time using a test whose probability of a false positive response is 2.5 percent. The TAL is determined by an approved statistical software package and applies to air methods only.
- 66. **TARGET CONCENTRATION (TC)** – The expected concentration based on 100 percent recovery.
- 67. **TREATMENT LEVEL** – A negotiated concentration for a specified contaminant in a specified extract or total waste that must be met by any method designed to physically or chemically change the nature of a hazardous waste.
- 68. **UNCERTAINTY IN FOUND MASS (UIFM)** – In the regression of FC versus TC, this is one-half the difference between the upper and lower 95 percent prediction bounds of the TC when the TC is equal to the monitoring level.
- 69. **VAPOR SCREENING LIMIT (VSL)** – The level to which an item is monitored to determine the agent contamination level. This is done by containing the item in an enclosed space to limit incoming dilution. VSL is the same concentration as the STEL.<sup>C1</sup>
- 70. **WORKER POPULATION LIMIT (WPL)** – Average allowable 8-hour TWA concentration that an unmasked worker could be exposed to for an 8-hour workday and 40 hours per week for 30 years without adverse effect.<sup>C1</sup>
- 71. **Z** – Generic designation for the applicable monitoring level such as STEL, WPL, VSL, GPL or SEL.<sup>C1</sup>

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### APPENDIX D – ACRONYMS

#### APPENDIX D - ACRONYMS

ABB	Asea Brown Boveri, Inc.
AC	hydrogen cyanide
ACAMS	Automatic Continuous Air Monitoring System
ACEM	Automatic Continuous Emissions Monitor
ACGIH	American Conference of Governmental Industrial Hygienists
AEC	U.S. Army Environmental Center
AEL	airborne exposure limit
AFC	Adjusted Found Concentration
AgF	silver fluoride
AMC	U.S. Army Materiel Command
AMP	Agent Monitoring Plan
ANSI	American National Standards Institute
AR	Army Regulation
ASC	allowable stack concentration; also known as the source emission limit (SEL)
ASQ	American Society for Quality
BFB	bromofluorobenzene
BZ	3-quinuclidinyl benzilate
CAIS	chemical agent identification set
CASARM	Chemical Agent Standard Analytical Reference Material
CBD COM	U.S. Army Chemical and Biological Defense Command
CCV	continuing calibration verification
CDC	Centers for Disease Control and Prevention
CEMS	Continuous Emission Monitoring System
CFR	Code of Federal Regulations
CHP	Chemical Hygiene Plan
CI	chemical ionization
CK	cyanogen chloride
CMA	U.S. Army Chemical Materials Agency
COC	chain of custody

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CQAT	Chemical Quality Assurance Team
CRDEC	Chemical Research, Development and Engineering Center (now ECBC)
CSDP	Chemical Stockpile Disposal Project
CSM	chemical surety materiel
CV	coefficient of variation
CVAA	2-chlorovinylarsonous acid
CWM	chemical warfare materiel
DA	Department of the Army
DAAMS	Depot Area Air Monitoring System
DC	diphenylarsine
DF	methylphosphonic difluoride
DHHS	Department of Health and Human Services
DM	adamsite
DoD	Department of Defense
DOL	Department of Labor
ECBC	Edgewood Chemical Biological Center
EI	electron ionization
ERDEC	Edgewood Research, Development and Engineering Center
FC	found concentration
FM	Field Manual
FPD	flame photometric detector
FR	Federal Register
g	gram
g/mole	gram per mole
GA	tabun; ethyl N,N-dimethylphosphoroamidocyanidate
GB	sarin; isopropyl methylphosphonofluoridate
GC	gas chromatograph
GC-AED	gas chromatograph-atomic emission detector

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GC-FPD      gas chromatograph-flame photometric detector  
GC-MSD      gas chromatograph-mass selective detector  
GC-MSD/FPD      gas chromatograph-mass selective detector/flame photometric detector  
GD      soman; pinacolyl methyl phosphonofluoridate  
GPL      general population limit

H      Leinstein mustard  
HBESL      Health Based Environmental Screening Levels  
HD      distilled mustard; bis(2-chloroethyl)sulfide  
HF      hydrogen fluoride  
Hg      mercury  
HL      mustard-lewisite mixture  
HN-1      nitrogen mustard; bis-(2-chloroethyl)ethylamine  
HN-3      nitrogen mustard; tris(2-chloroethyl)amine  
HT      a mixture of 60 percent HD and 40 percent T

ICV      initial calibration verification  
ID      identification  
IDLH      immediately dangerous to life and health  
IOP      internal operating procedure  
IPA      isopropyl alcohol  
ISO      International Organization for Standardization  
ITMS      ion trap mass spectrometry

JACADS      Johnston Atoll Chemical Agent Disposal System

L      lewisite; chlorovinyl dichloroarsine  
L/mole      liters per mole  
LAMP      Laboratory Analysis and Monitoring Plan  
LCO      limiting condition of operation  
LDRUG      Land Disposal Restrictions – Utah Group  
LIMS      Laboratory Information Management System

**CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)**  
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LMQAP	Laboratory and Monitoring Quality Assurance Plan
LOP	Laboratory Operating Procedure
LOQ	limit of quantitation
LQCP	Laboratory Quality Control Plan
LQCPP	Laboratory Quality Control Plan and Procedures
m <sup>3</sup>	cubic meter
MDL	method detection limit
µg/mL	microgram per milliliter
mg	milligram
mg/m <sup>3</sup>	milligram per cubic meter
mg/mL	milligram per milliliter
mL	milliliter
mL/min	milliliter per minute
mm	millimeter
MSD	mass selective detector
MS/MSD	matrix spike / matrix spike duplicate
N/A	not applicable
ng	nanogram
ng/L	nanogram per liter
NIOSH	National Institute for Occupational Safety and Health
NO <sub>x</sub>	nitrogen oxide
NRT	near real-time
NS	not specified
NSCM	non-stockpile chemical materiel
O&M	operations and maintenance
OJT	on-the-job training
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
P&A	precision and accuracy

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Pam	pamphlet
PCT	preconcentrator tube
PD	phenyldichloroarsine
PDARS	process data acquisition and recording system
PEL	permissible exposure limit
PFDTD	perfluoro-5,8-dimethyl-3,6,9-trioxidodecane
PFPD	pulsed flame photometric detector
PFTBA	perfluorotributylamine
PL	public law
PMCD	Program Manager for Chemical Demilitarization
PMT	photomultiplier tube
PPE	personal protective equipment
ppm	parts per million
ppmv	parts per million volume
PQL	practical quantitation limit
PS	chloropicrin
psia	pounds per square inch absolute
PTP	Proficiency Testing Program
QA	quality assurance
QA/QC	quality assurance/quality control
QC	quality control
QL	quality laboratory
QL	O-(2-diisopropylaminoethyl) O'-ethyl methylphosphonite
QMS	quality management system
QP	quality plant
RCRA	Resource Conservation and Recovery Act
RDT&E	Research Development, Test, and Evaluation
RL	reportable limit
RMD	Risk Management Directorate
RPD	relative percent difference
RRF	relative response factor

**CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)**  
**APPENDIX D – ACRONYMS**

RSD	relative standard deviation
RTAP	real-time analytical platform
RTW	retention time window
SA	arsine
SARM	standard analytical reference material
SBCCOM	U.S. Army Soldier and Biological Chemical Command
SC	Systems Contractor
SCF	standard cubic feet
SD	standard deviation
SEL	source emission limit; also known as the allowable stack concentration (ASC)
SMP	Site Monitoring Plan
SOP	Standing Operating Procedure
SPM	Site Project Manager
SRR <sub>AL</sub>	statistical response rate at alarm level
SSR	Shipment Status Report
STEL	short-term exposure limit
T	bis[2-(2-chloroethylthio)ethyl] ether
TAL	target action level
TC	target concentration
TM	Technical Manual
TOCDF	Tooele Chemical Agent Disposal Facility
TPA	triphenylarsine
TWA	time-weighted average
UCAR	Utah Chemical Agent Rule
UIFM	uncertainty in found mass
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USACMDA	U.S. Army Chemical Materiel Destruction Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USC	United States Code
USEPA	U.S. Environmental Protection Agency

**CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)**  
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VSL	vapor screening limit
VX	O-ethyl S-(2-diisopropylaminoethyl)methylphosphonothioate
WPL	worker population limit
Z	monitoring level

## CDRL 24 – LABORATORY QUALITY CONTROL PLAN (LQCP)

### LIST OF EFFECTIVE PAGES

List of Effective Pages	
Page No.	Rev/Chg No.
1 - 21	R6C1
18 - 25	R6C2
26 -36	R6C1
37	R6C2
39 - 41	R6C1
42	R6C2
43 - 140	R6C1



## PROCEDURE CHANGE FORM

## DOCUMENT CONTROL

Procedure Number and Title: CDRL 24, Laboratory Quality Control Plan (LQCP)

Existing Revision/Change No.: R6C0

New Revision/Change No.: R6C1

Requestor: Mike Mendenhall

Phone: 7652

Date: 9/13/05

Need By Date:

Project Management Plan Related? ☐ Yes ☒ No

If Yes, Which Project: \_\_\_\_\_

Procedure Owner indicates decisions below  
(required for Interim Change)Type of Change: ☐ Interim Change ☒ Routine Change ☐ RevisionPermit Controlled Document Affected? ☒ Yes ☐ NoDoes this change affect or add text for a Corrective Action? ☒ No ☐ Yes

If Yes, What #:

Date Due:

QM Reviewer – contact Procedure Owner if changes are needed to the proposed Procedure Change or Revision

Validation Required? (SOPs only) ☐ Yes ☒ NoValidation Type (if required): ☐ Walk-Through ☐ Pilot Run ☐ Agent Ops

Mike Mendenhall

Procedure Owner print and sign name

9/19/05

Date

## Change Description and Summary:

Changes as directed by State of Utah DSHW. A note was added at the beginning and italic/bold text added throughout to identify items that have not been approved by the Executive Secretary for use at TOCDF. A written request must be submitted and approval granted from the Executive Secretary prior to implementation.

Additional changes were made in the following numbered sections:

1, 2<sup>nd</sup> para, 2.1 1<sup>st</sup> para, Table 5-1, 5.5.1, 5.7, 6.2.1 2<sup>nd</sup> para, 6.5, 7.1, Table 9-1, 10.1 1<sup>st</sup> para, 10.2.1, 10.2.2, 10.3.2, Table 10-2, Deleted Table 10-3 "RDTE Dilute Solution Preparation and/or Verification Frequency", 10.3.3, 10.5.2, Table 11-1, Table 12-1, Table 12-2, 12.3 7<sup>th</sup> para, Table 12-3, Table 12-4, 12.4.2 5<sup>th</sup> bullet, 13.2, Table 13-3, 13.4, 14.2.1 2<sup>nd</sup> para, 14.2.1.2 1<sup>st</sup> bullet under "Perform Corrective Action", 14.2.2.1 2<sup>nd</sup> para, Table 14-1, 14.2.2.4 3<sup>rd</sup> bullet, Table 15-1, Table 15-5, 16.4 2<sup>nd</sup> para, 16.7.1 3<sup>rd</sup> para, 16.7.2.1, 17.5 1<sup>st</sup> para, & 17.7.

Appendix A: 1.1, Table A.2-3, Table A.2-4, Table A.2-5, Table A.3-1, 3.2.9.2, 3.2.9.3, 3.2.10, 3.2.12.2, 3.2.13, 3.2.14, 3.5 2<sup>nd</sup> para, 4.1, 4.2.1 2<sup>nd</sup> para, Table A.4-1, 4.7, Table A.4-2, 5 2<sup>nd</sup> para, Table A.5-1, 6 2<sup>nd</sup> para, 7.2, 7.6, 8.2.

Appendix C: definitions 23, 55, 61, 69, 70 & 71.

(Attach additional pages if needed)

## Change Justification:

As required by State of Utah DSHW for approval.

Approved: Oct 27, 2005

PERMIT CONTROLLED DOCUMENT

THIS DOCUMENT IS NOT OFFICIAL UNLESS THIS BLOCK IS SIGNED  
CHANGE/REVISION APPROVED BY:

NAME: Janet Wilbur DATE: 10-31-05

CONTROL COPY #50



# PROCEDURE CHANGE FORM

## DOCUMENT CONTROL

Procedure Number and Title: CDRL 24, Laboratory Quality Control Plan

Existing Revision/Change No.: R5C~~14~~

New Revision/Change No.: 6

Requestor: Mike Mendenhall

Phone: 7652

Date: 11/19/04

Need By Date:

Procedure Owner Indicates decisions below:

Type of Change: ☐ Interim Change ☐ Routine Change ☒ Revision

Permit Controlled Document Affected? ☒ Yes ☐ No

Does this change affect or add text for a Corrective Action? ☒ No ☐ Yes

If Yes, What #: \_\_\_\_\_ Date Due: \_\_\_\_\_

QM Reviewer - contact Procedure Owner if changes are needed to the proposed Procedure Change or Revision

Validation Required? (SOPs only) ☐ Yes ☒ No

Validation Type (if required): ☐ Walk-Through ☐ Pilot Run ☐ Agent Ops

MIKE MENDENHALL *M. Mendenhall*

Procedure Owner print and sign name

11/23/2004  
Date

**Change Description and Summary:** Update to reflect programmatic changes in the Laboratory and Monitoring Quality Assurance Plan (LMQAP) and Monitoring Concept Plan (MCP). This includes AEL implementation as defined in these two documents.

(Attach additional pages if needed)

**Change Justification:** To incorporate programmatic guidance.

### PERMIT CONTROLLED DOCUMENT

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CHANGE/REVISION APPROVED BY:

NAME

*J. Wilcox*

DATE

10-31-05

*file only*  
*gw*